The Autobiography of Richard Teller Crane

1832-1912

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The AUTOBIOGRAPHY *of* RICHARD TELLER CRANE

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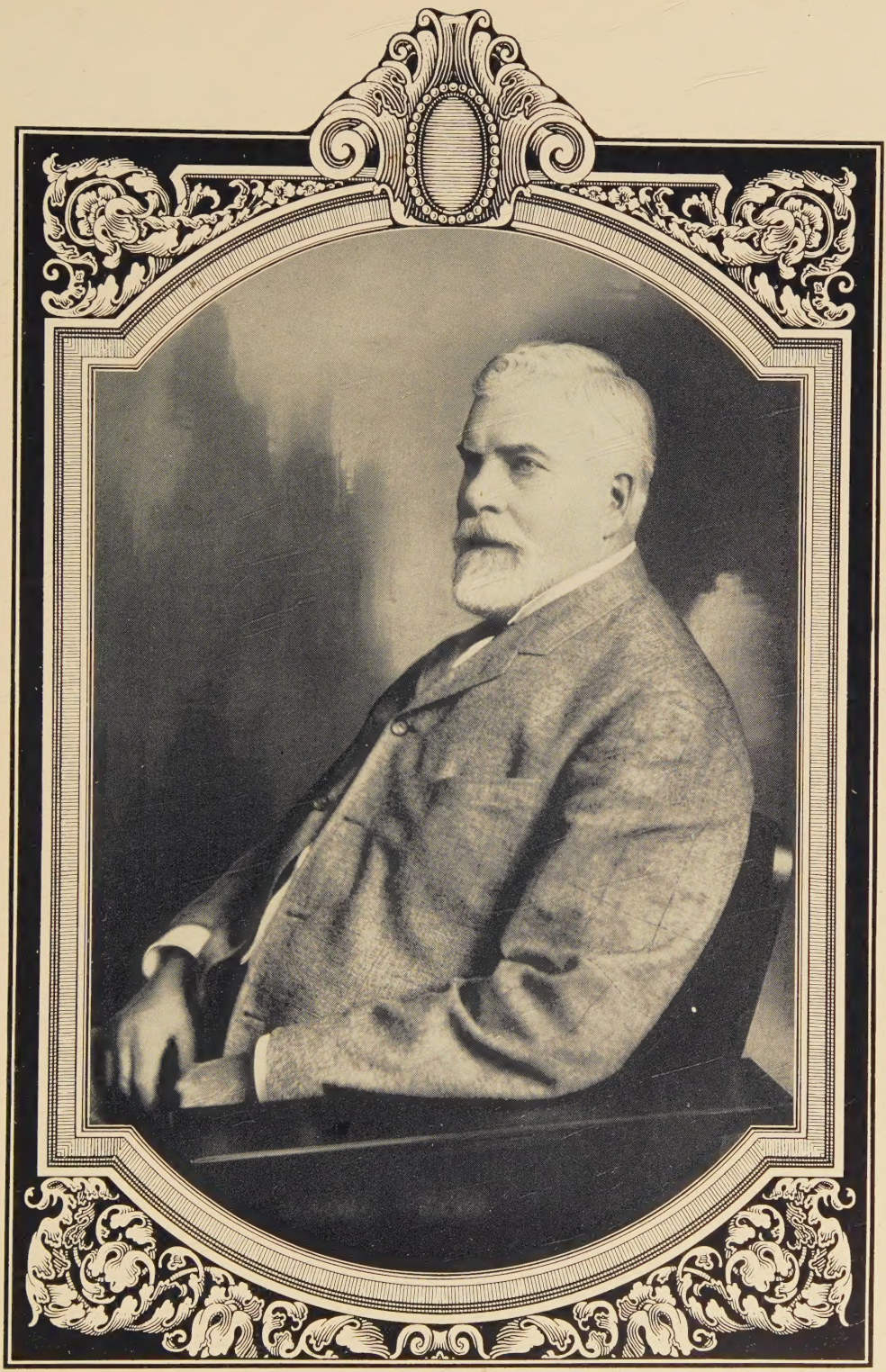


RICHARD TELLER CRANE
1832—1912

MY PARENTS

BEFORE beginning the history of my own life, it may not be inappropriate for me to follow the custom of the autobiographer and say a few words about my parents.

TIMOTHY B. CRANE
1773—1846

MARIA RYERSON
1803—1853

Timothy B. Crane, my father, was born at Durham, Mass., in the year 1773. He was a builder by trade, and, as will be seen, possessed more than an ordinary amount of mechanical ability. Before going to Paterson, New Jersey, (my birthplace) he lived in New York City, where I have understood, he gained quite a reputation in that line of work.

In those days a builder, to a large extent, also was an architect, and as an instance that my father was a good example of uncommon ability in this double capacity, I may mention that, after going to Paterson, he designed and erected a bank building on Main Street, in that city, which for years was an object of beauty and general admiration. In fact, this was practically the only building in Paterson, at that early day, that possessed real architectural merit.

During this early period in Paterson he had a sawmill on Van Houten Street and the mill-race.

About the year 1832 he conceived the idea of having a pleasure resort on a tract of land adjoining the Passaic Falls. To reach the property conveniently it was necessary to span a chasm seventy-five feet wide and fully as deep. In overcoming this obstacle my father showed that he was considerable of an engineer, for he designed and built on the land a truss suspension bridge, about ninety feet long, and drew it across the chasm by means of ropes attached to iron rings that were fastened in the rocks.

PASSAIC FALLS

To get a proper idea of what this meant, it should be remembered that engineering facilities were not plentiful in those days; that there were no bridges of any account to serve as models, and that my father had not made a specialty of bridge-building.

Considering all these conditions, and the further fact that the bridge had to be drawn across this chasm, it may be regarded as quite a remarkable feat of engineering.

His general ingenuity was illustrated further in his preparations for Independence Day entertainments at his resort. Wholly by himself he made excellent fireworks. As I remember, his rockets, set pieces, etc., would compare favorably with the standard fireworks of the present day, and everything connected with them, from the foundation up, he made himself. For the illumination of the grounds he arranged small,

open, colored lamps, holding floating wicks, which were suspended among the trees.

Besides being mechanical, a competent engineer, an architect of taste and judgment and a reliable builder, I should judge, from what I saw and heard, that my father also was a man of more than ordinary intelligence.

He kept himself well informed on the questions of the day. In company he usually was the central figure, carrying the burden of the conversation, being listened to with deep interest and marked respect.

I particularly remember him speaking of Governor Clinton of New York, a leading figure in public life at that time.

I do not know and can not explain why, with all his talents, skill and industry, my father did not make more material progress, except on the ground that at that time practically no one found it easy to make more than a living. Opportunities for acquiring wealth or anything more than a competence were few and far between.

My father's death occurred in the year 1846, at the age of 73, at which time I was fourteen years old.

Undoubtedly it was from his mechanical ability that I inherited my taste for mechanics.

My mother, whose maiden name was Maria Ryerson, was born in 1803, and was the eldest daughter of Tunis Ryerson, who lived on a farm west of Paterson. She was the flower of a large family, possessed a sweet and beautiful disposition and certainly took as much interest in her children as mothers generally had time to do then.

Owing to my father's advanced age, the burden of raising the children fell chiefly upon her for some time before his death and wholly for the seven years which she survived him, and she is entitled to much more credit than he for whatever early bringing up I received.

Being a firm believer in the great advantage of boys having trades, it was her earnest desire that her sons should learn some trade, and this they all did.

Her children, however, had little opportunity to secure an education, the family being in such poor circumstances that they were obliged to go to work at a very early age.

My mother was fifty years old at the time of her death, which occurred in the year 1853.

CHILDHOOD

MEMORIES

I WAS born at Paterson, New Jersey, on the Totoway Road, near the Passaic Falls, on May 15, 1832, and was the third in a family of four children, my brother Franklin being the eldest, then coming in order, my sister Jane, myself, and Charles S.

Soon after my birth my family moved to Passaic Falls, where we lived until 1838.

Early recollections of my childhood may not seem of any particular importance to-day, but they come to me—these little incidents that happened while I was less than six years of age—far more clearly than other and, perhaps more important events of comparatively recent date.

It is a peculiarity of the human mind to remember the casual happenings of sixty or seventy years ago, and to forget the things of yesterday.

How distinct, for instance, is the memory of my holding my brother Charles, when he was a baby, yet I could not have been more than two years old then. How well I recall my colored nurse, who used to take me to an island just above the Falls, and bathe me there in a pool of water that was almost hidden by the shrubbery which entirely covered the island. The memory remains, but the island was washed away years ago.

I can see my brother Charles' bleeding hand when, while splitting a spool with a hatchet, I cut off part of his thumb. I recall my fright when my sister and I, returning from school, were chased by a savage dog; and I remember Miss Brewster, from the Falls, to whom I went to school.

I remember clearly the raising of the dam above the Falls, which is still standing.

One day the builders dropped a big stone from the top of the dam which broke a horse's leg and I remember the shooting of this horse.

No less clear is my recollection of the time when a man swam across the river carrying me on his back; or of a man named Hillsdale who was fatally hurt by falling down our stairs. The frequent serving of dinner in an arbor to people who came from a distance to visit the Falls also is a well remembered feature of those early days.

I remember that, through the carelessness of a drunken workman in a quarry, who put in an overcharge of powder, a stone weighing several hundred pounds was hurled from the quarry on the other side of the Passaic River, below the Falls, and tore the top off a tree standing close by our house. Up to a recent date the stone lay where it then fell and the tree was still standing.

I remember that my uncle Richard Ryerson (after whom I was named) on leaving for the West, gave me a hen with four chickens.

The death of my grandmother, Jane Ryerson, which occurred in 1838, is also one of these early memories.

I could mention many more incidents of my early childhood, but these are enough to show how such things are remembered and how vividly they help me to recall practically the complete picture of my boyhood.

LIFE AT PATERSON

IN common with many others, my father was seriously affected by the panic of 1837, at that time losing the Falls property and becoming very poor.

Our family then moved from the Falls to Paterson, at first living opposite the mill-race near Prospect Street; but after a short time we moved to the east side of Van Houten Street, about half a block south of Main Street. We next lived for a time in a building on Broadway called "St. John's Hall," which contained a Masonic hall, where my father conducted a sort of hotel.

Throughout this period nothing worth recording transpired; during all of it the times were so exceedingly hard that my parents had a severe struggle to get a living.

About the year 1840 we moved to the west side of the river, on Hamburg Avenue. I was then eight years old, and had received in all about two or three years of schooling.

I have a distinct recollection of the Harrison and Van Buren campaign of that year, and of marching in the processions. This campaign was an unusually enthusiastic one. Among its novel features was a ball about ten feet in diameter, set in a frame, which the Harrisonians rolled about the country, with the object, I suppose, of showing how they were rolling up votes for their candidates. In other words, it was a sort of forerunner of an enthusiastic meeting.

When the ball reached Paterson, a great demonstration followed, during which many farmers brought loads of logs into town, and some had raccoons chained to the logs, which had some special significance in connection with the campaign.

On that day a cabin was built of these logs, at the upper point of an open triangular piece of ground situated on the north side of Park Street and extending nearly to the river. In this cabin hard cider was served, which also seemed to be a feature of the campaign.

About this time my father, who, I presume, was a Harrison man, obtained possession of the hill on which the soldiers' monument now stands, and there he built a log cabin and started a resort. This cabin was

another clever example of his handicraft, as it was built entirely by him and not a particle of iron was employed in its construction.

Refreshments were served at this resort, and it became quite popular with Paterson people. My father also had a garden there, in which he raised vegetables, grapes, etc. He maintained this resort until the time of his death, which occurred there several years later.

A TRIP TO NEW YORK CITY

When I was about eight years old I accompanied my father on a trip to New York City, where we saw the ruins of the great fire that occurred in 1836 on the south side of Wall Street, at the place where the City National Bank now stands.

We visited an aunt living on the East River shore, not far from the present Erie ferry at Cortland Street. Having some business to transact, my father left me at her house, with the understanding that I should join him at a certain corner between there and the ferry.

Not meeting him upon my arrival at the appointed place, I became alarmed and, after a short time, made my way to the ferry, thinking he might have missed me and gone there. But I was unable to find him at the ferry or on the ferry boat, and so crossed over to Jersey City without him and looked up the car in which we were to have returned to Paterson, thinking I might find him there.

Failing in this, and being without money and not knowing what else to do, I started to walk to Paterson on the railroad track.

Just before dark I reached the bridge over the Hackensack River and walked across on the ties. There I found the draw keeper, who lived at the end of the bridge, and, upon telling him my story, he took me in and gave me supper and lodging. In the morning he offered me breakfast, but this I was too modest to accept, and, resuming my journey, I finally arrived in Paterson about ten o'clock in the forenoon.

As soon as my father missed me in New York he, of course, became greatly alarmed and spent the entire night looking for me at police stations and elsewhere. During this search he fell over a skid and injured one of his legs so severely that he never fully regained the use of it.

BEGINNING OF THE ERIE SYSTEM

The railroad over which I took that long tramp extended at that time only from Jersey City to Paterson, and its rolling stock for passenger service consisted of not more than one or two locomotives and cars. A train was made up of a locomotive and one passenger car, the latter being about the size of an ordinary street car.

A peculiarity of this road was that there was no station in Paterson, but when the train reached the outskirts of the town the locomotive was

detached and a team of horses drew the car into the middle of the town to the corner of Main and Market Streets, where a hotel was located.

No doubt this plan of handling the cars grew out of the old stage coach practice.

Another interesting feature of this road was that it was built with strap rails, as was the custom at that time.

The building of this railroad was a very bold undertaking, as well as quite an engineering feat for those days, and the men who built it are at least entitled to credit for their courage and skill, if not for their discretion, in attempting it.

This road on leaving Jersey City, as persons familiar with that section of the country know, first had to go through Burgen Hill, which necessitated tunneling right through solid rock. This in itself was a good piece of engineering work.

Next, the road had to cross the Jersey marsh, and it was not an easy matter to fill up this marsh and get a good road bed.

Another section that required clever engineering was where the road was brought across the Hackensack, Passaic and Saddle rivers on piling, each river having to be provided with a draw.

Thus it will be seen that the building of this road was a considerable undertaking, and doubtless, at the outset, it was a decidedly unprofitable venture.

At that time such a thing as building a road from Jersey City to Erie was not thought of, but when the enterprise of building the Erie road developed, this road was made part of it.

There were two means of traveling from Paterson to New York in those days; one by the railroad just mentioned, the other by a stage line running from Paterson down in the direction of New York and the Passaic River, from which point a steam-boat took the passengers to New York City.

MY NATURAL MECHANICAL TENDENCY

UNDOUBTEDLY I possess considerable natural mechanical tendency, for during this early period I found much pleasure in devising mechanical contrivances, such as simple machines operated by water wheels, the water power being furnished by a brook that ran through our yard. I also made sleds, boats, balls, bats, etc. Another pastime which afforded me much pleasure was the making and flying of kites.

In those days boys had to make all of their toys, and in my opinion it is vastly better for them to be obliged to depend upon their own ingenuity and efforts to produce articles they may desire for their amusement and pleasure, than to have such things supplied to them ready made without any effort or thought on their part, as is so generally the case nowadays.

MY FIRST EXPERIENCE IN WORKING

WHEN nine years old I was placed at work in a cotton factory tending cards, and worked in two different mills for a year or more. Next I was employed for four years in the tobacco factory of Mr. Stephen A. Allen. For a while my work there consisted of stripping tobacco, and later on I performed miscellaneous work and occasionally tended store.

After I had been with him about two years he decided to try the experiment of peddling tobacco, cigars, etc., to the stores around town, and I was selected for this position. In the work I first used a wheelbarrow, but afterwards the business increased to such an extent that it became necessary for me to have a hand-cart and helper. The largest amount that my sales reached in any one trip was about seven or eight dollars, which seemed to be very satisfactory to Mr. Allen.

It appears that I was quite successful as a salesman at that early period, and the trump card employed by me for the purpose of inducing business was to appear to be greatly disappointed when a customer stated that he was not in need of supplies; this generally brought an order.

A portion of the time that I was with Mr. Allen I worked mornings and evenings and attended school during the day.

After leaving Mr. Allen I worked one season for Mr. A. Van Houten on his farm in Totoway, at the brook, which property is now a part of the public park system of Paterson. My work there consisted of picking strawberries, and afterwards peas and other vegetables, which were raised for the market.

The following season I was employed by Mr. Van Houten's son William, at Small Lots.

MY LOVE OF NATURE

BEFORE leaving this portion of my history I think it proper to say that undoubtedly there has been a thread of romance in my makeup, for I always have been a great lover of nature. In my younger days the scenery in and around the Passaic Falls was exceedingly beautiful, and up to the time I commenced work, and even afterwards, one of my greatest pleasures was to ramble through many delightful spots to be found there. In fact, most of my leisure time was spent in this way.

Unfortunately this beautiful scenery was destroyed long ago by vandalism and by the encroachments incident to the growth of the town, and it is a great misfortune for the residents of Paterson that this was allowed to occur.

One can not imagine a more beautiful place for a park than the whole section extending from the soldiers' monument to a mile above the Falls, and had this property been retained as a public park, it would have been a source of the greatest pleasure to the people there for all time.

EARLY RECOLLECTIONS OF PATERSON

AS Paterson was a comparatively small place at that period, not much can be said about it. The only especially noteworthy feature of the town was its development of the water power, which was a very important enterprise and an excellent piece of engineering for those days, as is evident from the fact that it has stood ever since without change.

This water power was used almost wholly at that time in the cotton factories which manufactured cotton duck for sails. It is interesting to note in this connection that Paterson appears to have gone into the manufacturing of cotton goods on a large scale at this early period, which was before New England had taken it up so extensively.

Following are some additional matters of interest regarding Paterson at that time.

Mr. Colt, who afterwards went to Hartford where he became famous through his invention of the revolver bearing his name, had a gun factory at the end of Van Houten Street and the Race, which was surrounded by a picket fence, the pickets being made in the form of guns.

At the opposite end of Van Houten Street there was a large tract of land called Wheeler's Hill. Here a gentleman by the name of Wheeler had erected a residence that was an unusually handsome example of the typical New Jersey brown stone house. Until recently this dwelling was used as one of the city buildings.

On the north side of Main Street, two or three blocks up from Market Street was Roswell Colt's Hill.

There a family by this name had a beautiful residence. In a sort of valley opposite this hill was a section of the town called Dublin, a tough place inhabited mostly by a low class of Irish people and containing a famous spring called Dublin Spring.

In a hill just below the soldier's monument a man named Hartley had a stone quarry which was worked by him for a considerable time. It was said that much of the stone for Trinity Church came from this quarry.

YOUTH

LEARNING A TRADE

IN the summer of 1847 my uncle Henry Gasparo, the husband of my aunt Jane Ryerson, who lived in Brooklyn, secured for me an opportunity to learn the brass and bell-foundry and brass-finishing trade with Mr. John Benson, who was engaged in this line of business as well as coppersmithing on Water Street south of Catherine Street in that city.

I commenced in the brass foundry, and my first year was full of bitter disappointments and heart-burnings, largely due to my lack of mechanical knowledge, which rendered me extremely awkward in these matters and made my progress during that time very slow.

It was the common practice in that foundry, as, I presume, was then the case in foundries and shops generally, to treat beginners with much ridicule, and as no exception was made in my case, I became greatly discouraged,—so much so, in fact, that upon two occasions I made up my mind to quit and return to the farm.

In each instance, however, I was persuaded to remain, first, by my aunt Jane, with whom I boarded a portion of the time, and next by a fellow-workman, who had been one of my worst tormentors, but who, when he saw the bad effect his treatment had upon me, took pity on me and thereafter gave me considerable aid and encouragement.

These facts are of importance as showing how trifling an incident will sometimes change one's entire career.

After a while I acquired more insight into the work and hence made rapid progress in learning my trade.

I remember how anxious I was to turn out a good day's work there, and that nothing gave me so much pleasure and satisfaction as to be able to feel, at the close of the day, that I had done so. I could return to my boarding house under these conditions and thoroughly enjoy the evening.

Perhaps in this respect my feelings did not differ from those of other workmen at that time; but I am strongly inclined to believe, that in these days quite a different feeling exists among a large proportion of the working class, and that with many of them the less they can accomplish in a day without detection the better they are pleased.

The principal product of the Benson establishment was machinery for refining sugar, and in the department where I was employed the work consisted largely of making brass trimmings for vacuum and other pans required in that line. There they also made cocks, hand force-pumps, etc., and in the foundry produced large quantities of bells, ranging from 10 pounds to 800 pounds, in addition to which they did jobbing casting work.

This gave them quite a variety and enabled me to obtain a broader knowledge of the brass foundry business than is usually the case.

Their jobbing work consisted largely of brasses used on steam engines that were manufactured for a man named William Burton, which fact is worthy of particular notice at this time, for the reason that he was the first person in this country to take up the manufacture of steam engines in a systematic and businesslike manner. Prior to that they had been built in a very small way only, by machine shops doing miscellaneous work, which would take an order for a single engine, or any other piece of machinery that might be wanted.

But the specializing and systematizing of the machinery business, as introduced by Mr. Burton (who built nothing but steam engines) worked a great change, which has since resulted in the tremendous success that has been attained in practically all lines of machinery building throughout this country.

INSTANCES OF MY PROGRESSIVENESS WHILE IN THE BENSON FOUNDRY

ALTHOUGH my first experiences in the Benson foundry apparently would not indicate any great degree of mechanical skill on my part, it soon developed that I did possess considerable aptitude in that direction, as will be seen in the following instances:

Firstly, my experiment in pouring heavy brass castings.

In that foundry heavy cylindrical brass rolls, each about a foot deep, a foot in diameter, and weighing several hundred pounds, were made for a white-lead factory, to be used in grinding white-lead, and these castings were required to be absolutely sound.

The great secret of producing a sound casting in brass lies in pouring the metal while very hot, which fact I had already discovered. But, as all foundry men know, where the mold is made in green sand and it is as deep and heavy as the one just mentioned, the metal will strain the mold and burn into the sand, thereby producing a casting that is very rough and difficult to manipulate with the tools in a lathe.

This roll was so heavy that it was necessary to pour it with two crucibles, and I conceived the idea of pouring the first one as cold as possible, which avoided straining the mold or burning the sand, and then pouring the second one with very hot metal. By this method I obtained a casting that was perfectly sound and smooth.

The next instance was my experiment in casting bells. These articles were molded in green sand and also in loam, but at first I made them in sand only. In those days loam molding was considered a high art, and it was only by good fortune that I obtained an opportunity to try my hand at that method.

Having noticed that the men ahead of me, who were making bells in loam, invariably had trouble with the molds scaling, which produced a casting quite defective in appearance, I had the enterprise to make an investigation in order to see whether a better way of doing this work could not be discovered, and for this purpose visited a neighboring iron foundry where loam work was done. Finding that they used for the mold a very different material from that employed by our people, I decided to make some experiments along that line.

The idea I obtained from that iron foundry was that their material was much more "open" than ours, for which reason I considered it less likely to cause scabs in the casting. But although a casting made with that material would, in all probability, be free from such defect, still it would not be smooth enough to produce a satisfactory bell, and it then occurred to me that I could use this material for a bell mold by filling the pores in the surface of the mold with plumbago, which entirely corrected that defect and produced a perfect bell.

In view of the fact that Mr. Benson had employed an expert loam bell maker to start him in the business, I consider that my success in turning out an absolutely perfect bell was a great triumph for one so young in the business.

A still further example of my progressiveness occurred in connection with the making of a bell that had been ordered for use in a cemetery. It seems to be considered desirable (or, at least, was then thought so) that for such service bells should have a doleful tone; and, while I had no scientific knowledge of how such a tone could be produced, it occurred to me that it might be accomplished by leaving out some of the tin, thereby making the metal a little softer. Upon trying this experiment I succeeded in getting exactly the tone desired.

Another successful experiment of mine while working at bell making was in the case of a bell weighing 200 pounds more than the combined capacity of all the furnaces, which, of course, made it impossible to melt all the metal in the furnace.

It occurred to me that the difficulty could be overcome by melting the tin in the ladle used for pouring the bell, and then melting the copper in the furnace and pouring the melted copper into the ladle containing the melted tin. In this way I was able to get the amount of metal necessary to produce this bell.

ILLUSTRATING MY HABITS OF OBSERVATION

AFTER working about two years in the foundry portion of the Benson establishment, I spent about the same length of time in the department devoted to brass finishing, etc., where, in addition to finishing

the trimmings for vacuum pans, as already mentioned, I was employed in putting these pans together, and also in putting the trimmings on them, all of which made quite a variety of work.

In this foundry they had a small engine and boiler, and during part of the time that I was there I also acted as engineer. No instructions whatever were given me about this work; I was simply told to go ahead and run the engine, make the fires, keep up the water, etc.

While working there an incident occurred that is perhaps worthy of mention as illustrating my habits of observation.

Mr. Benson had built a sugar refinery adjoining his foundry, in which he placed a large engine for running the machinery connected with the refinery, and he took particular pride in this engine as it had been built by one of the best makers in that part of the country.

There was, however, a pounding in the engine, that no one seemed to be able to find, and it annoyed Mr. Benson so much that he finally said he would give one hundred dollars to the person who could locate it.

Having some leisure time one afternoon, I went in to look at the engine, and it then occurred to me to see whether I could discover the cause of the pounding. I immediately put my finger on the key that fastened the piston-rod to the cross-head, as I suspected this was the cause of the trouble, and found it was loose. Upon calling the engineer's attention to it, he tightened the key, whereupon the pounding at once ceased.

Whether or not Mr. Benson ever learned who found the cause of this trouble and corrected it, I do not know, but I certainly never received any credit for it, much less the one hundred dollars.

WAGES $2.50 PER WEEK

DURING my first year in the Benson foundry I received $2.50 per week, after which my wages were increased fifty cents a week each year. For a while I boarded with my aunt Jane; but as it was not convenient for her to keep me, owing to the fact that her house was small and that she had a number of young children and did her own work, she soon obtained, through one of her friends, a boarding place for me with some maiden ladies, who, as a special favor, boarded me for two dollars a week. As my washing cost me twenty-five cents a week, this left but twenty-five cents a week for all my other requirements.

At that time I had the usual "boy" appetite, and as I was encumbered with an unfortunate amount of modesty, and there was rather a peculiar arrangement for serving the meals, I never had enough to eat, the result being that I was about half starved for a long time.

RECOLLECTIONS OF BROOKLYN AND NEW YORK CITY

BROOKLYN

BEFORE leaving Brooklyn I think it well to mention a few points of interest in reference to conditions that existed there at that time. When I went to Brooklyn in 1847 the City Hall was being erected and it was practically on the outskirts of the city, but few scattering dwellings being found beyond that point.

The city had but one omnibus line, which ran between the Fulton Street ferry and the City Hall, and consisted of probably not more than half a dozen vehicles. There were no theatres or other places of amusement.

At that time the city was without gas, water works, or sewerage system, gas being introduced soon after I moved there and the water works and the sewerage system at a later period. Prior to the establishment of the water works the supply of drinking water was obtained from pumps located at various street corners.

On one or two occasions the East River was frozen over so that the people were able to cross on the ice,—and once the bay was frozen solid for miles, making it necessary to cut a passage through the ice to allow ocean steamers to come up to the city, a tug being employed to keep this passage open.

It was my custom while living in Brooklyn to attend Henry Ward Beecher's church quite regularly and I listened to his sermons with much profit.

When I first went to Brooklyn I was as homesick as any one could be and longed to return to the country, which always had a special charm for me, but after being there a year or two I became greatly fascinated with the city and felt that I could not enjoy living anywhere else.

In those days all the life of the city was on Fulton Street, and on Saturday evenings this street was filled with gay people, making it one of the most enjoyable places imaginable.

At that time there was a park on the heights in Brooklyn, where the Wall Street Ferry now lands, and nothing could be grander than the view from that point in the evening. I frequently spent Sunday evenings there listening to the many church bells and chimes in New York City and enjoying the lights on the vessels and their movements in the bay.

To my mind Brooklyn Heights, that is, the portion commanding a view of the bay, is, even at the present day, the most delightful residence district around New York City.

NEW YORK CITY

In 1847 New York City was not built up much above 23d Street. Beyond that point the streets were largely cut through rock and basins were filled in to bring the streets up to grade.

The great life of the city then was between Canal St. and the Astor House. There were several hotels lower down on Cortland and Fulton Streets, but the Astor House was the one farthest up town.

Omnibuses afforded the only means of transportation in the city and I believe they did not run beyond Bleeker St., which probably is two miles from the Battery.

The city then contained but three parks: Battery Park, City Hall Park, and Washington Park. Of theatres there were four, viz.: Burton's on Chamber St., opposite the City Hall; the Chatham, on Chatham Square; the Bowery, and the Broadway. Another place of amusement, called the Hippodrome, was conducted at a place where the Fifth Avenue Hotel afterward stood.

While I cannot say that I saw pigs running in the streets of New York, as Dickens did when he visited the city in 1836, I did see a wild bull in the City Hall Park, apparently without any attendant, that ran into a woman, knocking her down.

I remember that while I was living in New York City, P. T. Barnum brought out Jennie Lind, and at the concerts given by her in Castle Garden she created a tremendous sensation.

Another interesting event of that period was the visit to this country of Louis Kossuth the Hungarian patriot. In New York he was given the greatest demonstration and reception that I ever saw, the entire military force turning out and filling Broadway for miles.

The great ovation received by him there and throughout the country generally shows what intense interest this nation then felt in people struggling for their liberty.

The great business in New York at that time was ship-building, and the principal yards were located on the East River between Fulton and Grand Streets. In addition to these ship-yards there were floating dry docks; also large iron works, where the engines used in the steamers were built. The most important among the iron works were the Morgan, the Secor, the Quintard, and the Delameter.

The product of these ship-builders consisted chiefly of sailing vessels and river steamers, and in the latter line they gained a very high reputation. I understand that their steamers were sent to many parts of the world, some of them going to China, and quite a number around the Horn to California, where they were used on the Sacramento River for many years.

It was during this period that Commodore Vanderbilt built his famous three thousand ton steam-yacht the "North Star," which I had the satisfaction of seeing. The building of a pleasure yacht of this size, it being as large as any ocean steamer then in existence, was looked upon as one of the greatest events of the age. The vessel was equipped with a walking beam engine, which was considered a very questionable experiment, on account of making the ship top-heavy. The type of engine generally in use at that time was what is known as the "side lever" engine, it being made in this way for the purpose of bringing the weight as low in the vessel as possible. The side-wheel steamer was then the only kind in use, the screw steamer having not yet been introduced.

MY WORK AS A JOURNEYMAN

TAKING UP THE MACHINIST'S TRADE

ALTHOUGH I had become, during the four years at the Benson works, a very good mechanic in the brass foundry and brass-finishing line, I decided that this was not to my taste and that I should prefer the machinist's trade for my life work, whereupon I secured a position in a machine shop in the lower part of New York City.

At that time my only qualification as a machinist was the ability to use a hammer and chisel and file fairly well.

The first job given me there was to face off the valve-seats in the foundation plates of an air pump. I was placed at work beside a man who had the same kind of a job and he immediately showed a disposition to race with me in the work. Of course I felt that I could not afford to lag behind, so put in my best efforts endeavoring to keep up with him.

The first day my work consisted entirely of the hardest kind of chipping. Not being used to this continuous hard chipping, my hands became very much blistered and by the time the day was over I was so thoroughly tired and used up that as soon as I reached home and had my supper I went to bed. By the end of the next day I became hardened to this work so that I could stand it all right and was then able to hold my own with my rival.

I soon found, however, that this shop would afford me no opportunity to learn to be a good machinist, as the work turned out there was of a very rough character.

WITH THE TAYLOR PRINTING-PRESS WORKS

About that time a friend introduced me to a young man who had learned the machinist's trade in the Taylor Printing-Press Works, which were located on Hague Street near Franklin Square, New York City, and feeling that in that shop I should be able to make more rapid progress in learning this trade, the work produced there being of a much higher order, I applied for and obtained a position with that concern.

There, owing to the great interest taken in me by the young man to whom I had been introduced, as well as to slack management on the part of the superintendent and foremen which enabled me to conceal my ignorance, I went ahead rapidly in learning the machinist's trade.

One of the first jobs assigned to me there was the fitting of a key, or feather, used in keying a printing-press cylinder to the shaft. In such cases a recess has to be made in the shaft for the key or feather.

I had to do the entire job; that is, make the recess, the key, and the groove in the cylinder. This work required the use of a shaping machine to form the key, and as I had never seen one of these machines before, this of course added something to my experience.

To do all this correctly was really a very nice piece of work, but through the help of the young man previously mentioned and the slackness on the part of the foreman to which I have already referred, I succeeded in turning out a thoroughly good job.

This was a much higher grade of work than anything I had done before in the machinist line, and it gave me so much confidence in myself that I got along nicely with all the other tasks given me in the vise line, and I did quite a variety of work.

One day the superintendent of the shop came to me and, pointing to one of the lathes, said "You go and run that lathe,"—the regular operator not having put in an appearance. As this was the largest lathe in the shop and was doing a class of work with which I was not at all familiar, I thought that I certainly was in for trouble. I said nothing, however, but hunted up my friend, who quietly enlightened me and I got through with it all right, thus escaping what might have been a very serious difficulty, for had I failed in this task no doubt I would have lost my position.

At that time there was a man who was having built, in a private room in this factory, a large printing press to rival the Adams press, which, at that time, had a monopoly in the book-printing line.

In building this press the work generally was done outside of the room, in different parts of the factory, and then brought to this room to be assembled.

It happened that some of this work was assigned to me, and this man took such a fancy to me that he requested that I be allowed to go to his room and assist him in assembling the work, which I did. This, of course, was quite a compliment to me.

RETURN TO PATERSON

I had been working in this private room but a short time when my mother, who was then living in Paterson, became ill, and as she wanted

me to live near her, I gave up my position with the Taylor Printing-Press Works and returned to that city.

While there I obtained a situation with the Cook Locomotive Works, but as the work in their shop was not of a high character, I became dissatisfied with it, and upon the death of my mother, which occurred soon after that, I returned to New York City.

WITH THE HOE PRINTING-PRESS WORKS NEW YORK CITY

KNOWING that Hoe & Company, printing-press manufacturers in that city, did the highest grade of machine work in the country, I decided to try to obtain employment with them, believing that this would give me an opportunity to get into a still better class of work and become a better machinist.

I was fortunate in securing this position and also in being placed at a vise next to a man from Paterson. He being one of the old hands, was thoroughly acquainted with the run of the work in the shop and rendered me great assistance by instructing me regarding the correct way to go about my work, the result being that I was enabled to make good progress in learning the trade.

While working for Hoe & Company I lived on Grand Street in a boarding house situated where that company's works now stand.

MY WAGES AS A MACHINIST

At that time $1.75 a day was considered very good wages, but notwithstanding that I started in this shop at that rate, I soon asked for an increase and then was given $2.00 a day, which was strictly first-class pay for a machinist at that time. I mention this to show that in a very short time I had become something of a machinist, or at least had gained that reputation.

I had been with Hoe & Company comparatively a short time when the panic of 1854 arose. Being one of the new hands, I was laid off, and found it impossible to secure any employment during the fall and winter of 1854-1855.

REMOVAL TO CHICAGO

The Spring of 1855 found me almost at the end of my savings, and there being no improvement in the business outlook in New York City, I became thoroughly discouraged.

It then occurred to me that if I could see my uncle Martin Ryerson, who at that time was living in Chicago, where he was engaged in the

lumber business, possibly he might be willing to assist me either to find employment or to start in business for myself. Although I had met him but once or twice during his visits to New York City, my aunt Jane had told me so much about him that I had formed a very high opinion of his general character and business ability and knew he had been successful in business in Chicago.

Such a trip was looked upon in those days as quite an undertaking, but, after weighing the question very carefully, I decided to make the venture.

On the journey nothing of particular importance occurred. In those days sleeping and dining cars of course were unknown. Also, the railroad was not then completed all the way between Cleveland and Toledo, and when it reached Sandusky Bay, east of Toledo, a ferry-boat was employed to transfer passengers to the point where they again took the train.

My trip occurred during a rainy period, and the passengers, in transferring from cars to boat and then from boat to cars, became thoroughly drenched. By the time I reached the car it was so crowded that I was barely able to find a seat. As this was in the evening, I was compelled to spend the entire night in this car, and the stench caused by the wet clothing of the passengers and the crowded condition of the car was almost unbearable.

While on the way to Chicago an engine on one side of the locomotive broke down, making it necessary to run into Chicago on a single engine.

I arrived in Chicago on the first day of May, 1855. Here I was received by my uncle in an exceedingly hospitable manner and he took great interest in me.

A TRIP TO MICHIGAN

I soon had a talk with my uncle about my affairs,—my purpose in coming to Chicago, etc.,—but as he apparently wished to take some time to consider the matter and look me over, he invited me to accompany him on a trip which he was about to make to Muskegon, Michigan, where he owned some sawmills. We traveled from Chicago to Kalamazoo by rail, and thence by stage to Grand Rapids, where we remained a day or two. We then took a steamer down the Grand River to Grand Haven, from which point we proceeded to Muskegon in a canoe drawn by an Indian, who waded in the water along the lake shore. After spending a few days there, I returned to Chicago in a sailing vessel, which was loaded with lumber.

EARLY RECOLLECTIONS OF CHICAGO

BEFORE continuing the history of my life after coming to Chicago, perhaps it may be of interest to note some of the conditions which I remember as prevailing here at that time.

POPULATION

The city then had a population of about seventy-five thousand and was one of the most forlorn looking places.

CONDITION OF STREETS

The only thing to be found in the way of street paving was an occasional strip of planking in the center of some of the most prominent downtown streets, and nothing else was used for paving for many years.

As the soil was practically a black muck, and in those days the spring of the year seemed to be unusually long and wet, the streets during that period were like a sea of mud.

It can be readily understood that under such conditions it was extremely discouraging and depressing to try to get around through the city with a horse and wagon.

RAISING THE STREET GRADE

Not long after I came to the city an ordinance was passed providing for raising the grade of the streets four feet, and its effect can be easily imagined. While some people complied promptly and raised their houses and sidewalks, many were very slow to do so, the result being that for years the sidewalks throughout the city were in an exceedingly unsettled condition. Then, about the time this difficulty was overcome, the grade was again raised, thus causing a repetition of this annoyance.

After the fire of 1871, the grade was once more raised, this time being brought up to the present standard, and it was not until then that this nuisance finally ceased.

No doubt the authorities realized at the outset that the grade of the streets ought to be raised much more than four feet, but I presume they feared that if they advocated elevating them to the proper grade at once, the people would consider it so stupendous an undertaking that they would not consent to it, and for this reason ordered it raised only four feet at a time, something on the idea of the story about cutting off a dog's tail.

One can hardly believe now that a plan just the reverse of elevating the streets ever could have received serious consideration, but it is a fact

that some brilliant (?) man in those early days did suggest that the street grade be lowered, and this experiment actually was tried in Lake Street, the result naturally being to make a sort of canal of the street.

I suppose the object of this plan was to get down below the black muck, and thus obtain a firmer soil to support the planking.

BUSINESS DISTRICT

Nearly all the wholesale and retail business was located on Lake Street between Fifth Avenue and State Street. The wholesale stores in the dry-goods and hardware lines had a frontage of not over 20 feet each and practically all of their business was confined to the first floor, the basement and upper floors being used but little, as in those days there were no power elevators in the city.

RESIDENCE DISTRICTS

The best residence districts did not extend beyond Halsted Street on the west, Congress Street on the South, and Chicago Avenue on the north. The better part of the city seemed to be concentrated on Washington Street and in that neighborhood.

COURTHOUSE, CHURCHES AND THEATRES

The courthouse was situated in the same block then as it is to-day. The other three corners of Clark and Washington Streets were occupied by churches. There was a Baptist church at the south-east corner of Washington and La Salle Streets, which afterwards was taken down brick by brick and rebuilt on the south-west corner of Monroe and Morgan Streets.

At that time the city had but one theatre.

PRINCIPAL LINES OF BUSINESS

At that period and for many years afterwards nearly all of the business in Chicago consisted of lumber, grain and the packing of hogs. The center of the lumber district then was about Lake Street and the river and extended on all sides of the river.

The packing industry was located along the river from Twelfth Street south for about a mile, a very extensive business being carried on in the packing of dressed hogs. These were shipped in to commission men and could be seen piled up on the sidewalks throughout a large portion of the business section of the city. The driving of hogs and cattle through the city was a common sight for many years.

Once, when a herd of cattle was crossing a fine iron bridge that had just been constructed at Rush Street, the bridge was turned to allow a vessel to pass before all the cattle had succeeded in reaching the farther

side. As those remaining on the bridge rushed to one end, it became overbalanced, plunging them all into the river and completely wrecking the bridge.

RAILROADS

When I came to Chicago there was only one through line running into the city from the East, this being the Lake Shore and Michigan Southern. The Michigan Central, I believe, extended only from Detroit to Chicago.

The present western branch of the Chicago & North-Western Railroad, then called the Galena Railroad, for several years had been running quite a distance west of Chicago, and it must have done considerable business, as it had a good round-house and repair shops in Chicago.

The Chicago & North-Western Road proper had made a small start on its line towards St. Paul, and had a machine shop and some repair shops at about Chicago Avenue. These shops, however, were on a very small scale, as will be seen from the fact that the power for them was supplied by a little old locomotive that was blocked up and run as a stationary engine.

LOCAL TRANSPORTATION

The city, of course, had no street cars at that time, and the only omnibus line ran from the center of the city west on Madison Street to Ogden Avenue. At that point stock yards were located and the place was known as "Bull's Head."

BRIDGES

There were but seven swinging bridges over the river, and the Lake Street bridge was the only one that swung from the center. The others all swung from a pier at one side of the river, the opposite end of the bridge being supported on a float. All these bridges were very slow in operation.

At Rush Street there was a passenger ferry, consisting of a scow that was drawn across the river by men pulling on a rope which extended from shore to shore. Many people also crossed the river in row boats that were operated by boys.

When we consider these poor facilities for crossing the river, also that as there was but one tug boat, most vessels had to be drawn through the river by men in a row boat who took a line from the boat and fastened one end to a pile, the sailors on the vessel then drawing the rope in, either by hand or by working a winch, some idea may be had of the annoyance suffered by people who had to cross the river on business. Many times an hour or two would elapse before men with teams were able to cross.

WATER WORKS

At that time the pump used for supplying the city with water con-

sisted of a home-made horizontal engine of about 50 horse-power with a pump attached.

This was located at Chicago Avenue and the lake, where the present plant stands, and for a long time it took the water from the shore, which then was but a short distance back of the water works.

The intake was protected by a wire screen to keep out the fish, and often this would become completely choked by small fish that came up to it in great numbers. A considerable number of these fish would, however, get through the screen, and then through the pump and mains and stop up the supply pipes in the houses, so that frequently it was necessary to call a plumber to apply a pump in order to force the fish back into the mains. A pump for this purpose was an essential part of a plumber's outfit in those days.

To prevent this difficulty of the pipes in the houses being choked by the fish I devised what might be called a fish trap, which consisted of a sort of iron box having a screen across one end. Fish coming through the main pipes in a building would become lodged in one end of this box and stop there, instead of going through to the smaller pipes and stopping them up.

WINTERS UNUSUALLY COLD

The winters in Chicago in those early days seemed to be much colder than they have been in recent years, for I can remember that for a number of months each winter the river would be frozen solid, and it became a favorite place for those who wished to speed their horses. One of the chief pastimes in the city was to watch the races that were held on the river every afternoon.

CITY OVERRUN WITH RATS

Owing to the fact that the lumber district was so close to the center of the city, and that the sidewalks were made of planks, the city suffered greatly from rats; in fact, it was literally alive with them.

PROMINENT MEN

One line of our business in those early days was the installing of steam-heating apparatus in private houses and other buildings. This brought me in contact with nearly all the prominent men here at that time and I will mention those whose names now occur to me.

T. M. Avery
Jerome Beecher
M. Brown
Philo Carpenter
N. K. Fairbanks
P. D. Armour
William Bross
S. B. Cobb
T. J. S. Flint
Robert Foss

P. W. Gates
Wm. B. Hibbard
D. J. Lake
Charles Mears
S. B. McKeague
Wm. B. Ogden
H. H. Porter
Benjamin W. Raymond
Joseph T. Ryerson
Peter Schuttler
M. C. Stearns
Lambert Tree
Francis C. Sherman
Frank Thompson
Hobart H. Taylor
"Long" John Wentworth
George S. Hubbard
Sylvester Linn
Joseph Medill
Wm. Mattocks
W. H. McGie
Mayland Ogden
Potter Palmer
Julian S. Rumsey
J. Y. Scammon
F. F. Spencer
Mark Skinner
Hiram Wheeler
George Smith
Amos G. Throop
John Wilson
Dr. Williams

Chicago had many more men of prominence at that period whose names I do not now recall, and those pioneers appeared to be rather a remarkable class of men, possessing much greater strength of character, it seems to me, than the men of to-day.

MANHOOD

COMMENCEMENT OF MY BUSINESS CAREER

SOON after the trip to Michigan, previously mentioned, I had another talk with my uncle about business matters, and he told me to look around and see what I thought the chances were for succeeding in business in case he should give me a start.

This I did as well as my slight knowledge of business would permit, and upon reporting to him that I believed the prospects were quite favorable, he said to go ahead and he would assist me, and at the same time gave me permission to build a brass foundry at the south-west corner of Canal and Fulton Streets, where he had a lumber yard.

The opposite side of Fulton Street he also occupied with his office and a portion of his yard.

FIRST CRANE SHOP
1855

MY FIRST SHOP

I at once went to work and put up a small frame building, as shown above, on which I placed a sign, reading

R. T. CRANE
BRASS & BELL FOUNDRY

and made every preparation for business, the foundry in all its details being completed on the third day of July, 1855.

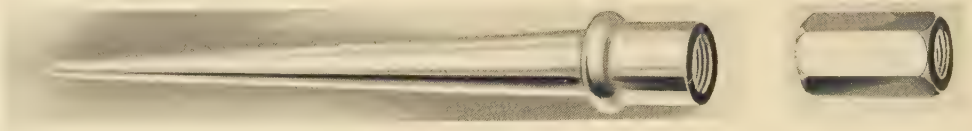
The sand required for moulding was obtained on the premises, a narrow strip that seemed to be suitable having been discovered under the black earth when excavating for the furnace.

I, of course, was very anxious to see how the furnace and sand would work, and as I had some patterns ready for an order, I concluded to take off a heat the day after the foundry was finished, notwithstanding the fact that it was the Fourth of July.

RESTORATION OF THE INTERIOR OF THE FIRST CRANE SHOP

The result of this trial was entirely satisfactory, the furnace proving a success and the sand working fairly well, at which I was greatly delighted and felt that now I was prepared to go right ahead with the business.

For molding I continued for some time to use the sand found on the premises, as I did not know where anything better for the purpose could be obtained. Subsequently, however, I found sand elsewhere that was superior.



ARTICLES FIRST PRODUCED

My first castings consisted of brass couplings used in connecting lightning-rods, and the copper lightning-rod points here shown, for both of which articles there was a great demand at that time.

I also obtained at once orders from Mr. Henry Warrington for castings of boxes and various other articles used by him in the building of engines.

AN IMPORTANT EVENT

I HAD been in business but a month or two when I received a call from Mr. Thomas Chalmers, Superintendent for P. W. Gates & Co., who were builders of freight cars, stationary and portable engines, saw mills, etc., and had a very large establishment for those days.

Mr. Chalmers brought with him some patterns for car-boxes and asked whether I could make these castings for his Company, stating that, on account of the scarcity of copper, the foundry from which they had been obtaining their supply of castings had disappointed them.

He seemed to be very anxious about the matter, and when I replied that I would make them for him, he was greatly pleased and left a large order, which was very gratifying to me.

At that time it was exceedingly difficult to obtain any copper in Chicago, and often I traveled over the entire city without being able to buy fifty pounds. Fortunately, however, I happened to know of a copper smelter in Detroit where I succeeded in procuring a cask.

This circumstance turned out to be of the greatest importance to me as it enabled me to accommodate Gates & Co. by executing their orders promptly, which they thoroughly appreciated, and this soon led to my receiving all their orders for brass castings, thus giving me a very substantial start in business.

SENDING FOR MY BROTHER

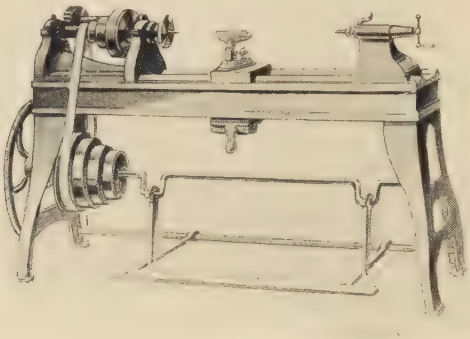
As the indications now were that the business was destined to be a success, and I found myself in need of help, I concluded to invite my brother Charles (who was an iron molder, in Paterson, N. J.) to join me, which he did during the Autumn.

FIRST STEP IN THE PRODUCTION OF BRASS FINISHED GOODS

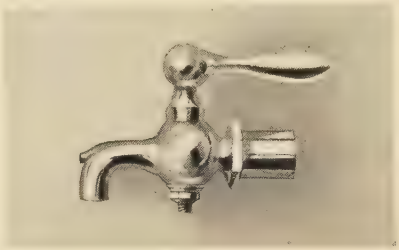
UNTIL then the business had been confined to the making of brass castings; but soon after my brother's arrival we decided to take up the making and finishing of brass goods, whereupon I sent for two first-class workmen whom I had known in Brooklyn. One of them, who was an exceptionally good workman, had charge of our brass finishing shop for a number of years, and it was largely through his superior mechanical ability that we were enabled to promptly bring this portion of our business into first-class shape. This man was Henry Jones, who is still living in Omaha.

We first took up the line of engine trimmings, and as Gates & Co. used large quantities of these goods and were disposed to help us along in every way, we found no difficulty in obtaining orders as fast as we could execute them.

At this time we put in one foot-lathe (like the one shown below) which was about as small a beginning as could be imagined. Only those who have operated such a lathe know what it means to turn out anything except small work on a machine of that kind.



The first piece of work made by us in this line was the cock here shown.



RENTING ROOM WITH POWER

AS THE business outlook continued to improve, we very soon decided that the time had arrived for us to go into the brass finishing line on a broader scale, whereupon we rented some room, with power, in a manufacturing building on the north side, facing the river, west of the Wells St. bridge, and put in half a dozen more lathes.

Our business now had reached a very flourishing condition, but still this was only a make-shift arrangement.

EARLY LIVING IN CHICAGO

UPON starting in business my brother and I tried several boarding-houses, but finding none to our liking, we concluded to try keeping "bachelor's hall," and for this purpose fixed up a loft in our brass foundry where we built a bunk and put up a small cook stove.

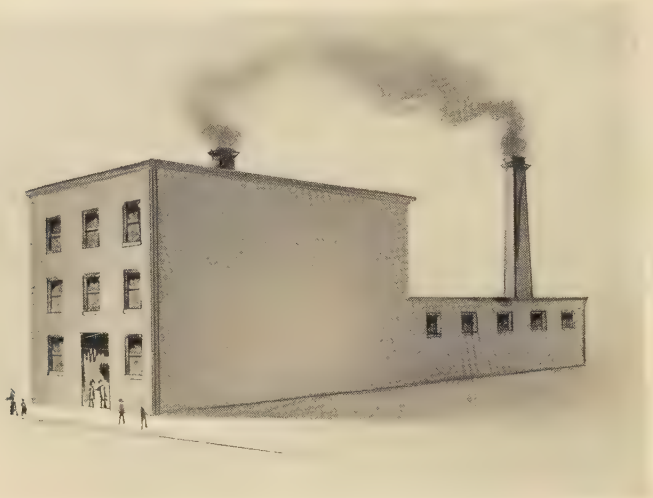
Here during one winter we managed to cook our own breakfasts, our other meals being obtained at various eating houses. One of the places patronized by us at that time was the famous Green Tree Inn, located at the northeast corner of Canal and Lake Sts.

The weather was so extremely cold that winter that some nights the bed-clothing near our faces would become stiff with frost caused by the freezing of the moisture from our breath.

In order to get our breakfast in anything like reasonable time we found it necessary to prepare everything the night before. We cleaned out the stove and put in some wood so that it was ready to light in the morning; also got the meat, potatoes, coffee, etc., ready on the stove, even cutting up the bread and potatoes, as otherwise they probably would be frozen so hard before morning that they could not be cut. Upon arising we at once started the fire, and by the time we were dressed everything was steaming away and soon we were enjoying a good breakfast. This plan proved rather unsatisfactory, however, and after that winter we abandoned it and returned to boarding.

FIRST EPOCH

EVERY important business naturally is divided into epochs, and I will call the first epoch in ours the consolidation of the business at No. 102 West Lake Street in 1856.



In the spring of 1856 we purchased a lot at No. 102 West Lake Street, where we erected a three-story frame building, 20 x 40 feet (as shown above) with a one-story extension in the rear for a brass foundry, put in a six-horse-power portable engine, and made further additions to our brass finishing machinery.

About this time we adopted the name of

R. T. CRANE & BROTHER

We now had a very good plant for those times—probably the best in Chicago, and during the remainder of that year we enjoyed a prosperous trade and continually added to our machinery and output.

SEEKING OUTSIDE TRADE

As we now had outgrown the demand for our goods in Chicago, I frequently made trips out of town canvassing for business, taking in such places as Milwaukee, Louisville, Rock Island, Davenport and Dubuque, in all of which a small business was being done in the engine line.

In those days there were no large interior towns that required our goods, nor was there any trade in our line west of the Mississippi River.

During these trips I visited St. Paul, then a very small town, containing but few residences and having no business in our line. I remember

that when I was there channels were being cut through the rocks in the streets for the purpose of putting in some water pipes.

Not a house had then been built on the west side of the river where Minneapolis now lies. There was, however, on the east side of the river at that point a small town called St. Anthony that contained a school and hotel, both of which were very small.

TAKING ON ADDITIONAL LINES

JOBBING OF WROUGHT IRON PIPE AND FITTINGS, STEAM WARMING

THUS far our business had been confined to the making of brass castings in a jobbing way (but chiefly for Gates & Co.), car boxes for railroads, and brass engine trimmings.

We now decided to take up the jobbing of wrought iron pipe and fittings, also the steam-warming business, and in the Spring of 1857 I made a trip to New York City, where I purchased my first stock in this line. While there I made inquiries for a suitable man to take charge of our steam-warming work, and Mr. A. B. Hay, of that city, being recommended to me for this position, I engaged him. He proved a success and remained with us for many years.

IMPORTANCE OF THIS STEP

Just what led us to enter upon the jobbing of wrought iron pipe and fittings and the steam-warming business I do not now recall, but in all probability it was due to the customers to whom we sold engine trimmings also requiring pipe, fittings and valves, and also because we felt that we had the ability to conduct a larger business than was afforded by the limited demand in the West for the articles we had been manufacturing. It will now be seen, however, that our going into this line was a step of the greatest importance to us, as it eventually became our specialized business.

LIMITED RANGE OF STEAM GOODS

IT is interesting to note that the demand then for pipe and fittings above 2-inch was so slight that we put in nothing larger than that size; in fact I do not believe there was any pipe in Chicago above 3-inch.

I am unable to show our first price-list, which was the standard and only list in this country up to about 1865, but a fac-simile is here given of one issued by us in 1869, which was identical with the original card, with the exception of a few variations in prices; also, I believe the first list did not go above 4-inch, while the one here shown included 6-inch.

NORTH WESTERN MFG. CO.

Revised List, Sept., 1869, Wrought Iron Pipe Fittings, &c

SIZE		⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	6
Wrought Iron Pipe	per Foot	9	9	10	12	16	23	32	40	56	90	1 30	1 60	2 00	2 40	2 80	4 00
Galvanized "	"	.....	15	15	18	24	33	44	55	75	1 20	1 65	2 10	2 50	3 20	3 75	5 00
Elbows	each	5	7	8	9	12	20	35	45	72	1 12	1 50	2 50	3 50	4 25	5 00	7 25
	"	8	9	11	12	18	24	47	60	90	1 50	2 00	3 50	4 75	5 75	6 75	9 75
Tees	"	10	12	14	15	25	30	57	75	1 12	1 85	2 50	4 75	6 00	7 20	8 50	12 00
Crosses	"	.....	22	25	40	50	69	70	90	1 25	2 35	3 60	.....	5 00	.....	.....	.....
Unions	"	.....	.....	.....	.....	18	30	45	60	1 00	1 50	.....	.....	.....	.....	.....	.....
Return Bends	"	10	10	11	13	15	20	26	33	46	80	1 10	1 60	2 20	2 85	3 50	5 00
Nipples, Bushings, Plugs, Caps Couplings, Reducers, Locknuts	"	75	82	1 00	1 25	1 65	2 50	3 50	4 50	6 30	15 00	.....	.....	.....	.....	.....	.....
Steam Cocks, Brass	"	.....	75	90	1 05	1 45	2 05	2 90	3 75	5 80	.....	.....	.....	.....	.....	.....	.....
Globe Valves "	"	.....	.....	.....	.....	.....	.....	3 25	4 50	7 00	12 00	18 00	24 00	30 00	.....	44 00	60 00
Check Valves "	"	.....	.....	.....	.....	4 00	5 00	6 00	7 00	10 00	16 00	20 00	.....	34 00	.....	45 50	58 00
Globe Valves, Iron, Screwed Ends	"	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	18 00	.....	.....	.....
Safety Valves " " "	"	.....	.....	.....	.....	1 40	2 00	2 75	3 50	6 00	8 00	10 00	.....	.....	.....	.....	.....
Steam Cocks	"	.....	.....	58	75	1 00	1 38	2 25	3 50	5 15	13 00	.....	.....	.....	.....	.....	.....
Gas, Service and Meter Cocks	"	.....	.....	.....	95	1 25	1 75	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Union Meter Cocks	"	.....	.....	.....	.....	1 25	1 75	2 80	.....	.....	.....	.....	.....	.....	.....	.....	.....
Gas, Service Cocks with Stops made Heavy for Gas Companies	"	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

EARLY HISTORY OF FITTINGS MANUFACTURING IN THIS COUNTRY

IT is interesting to show how exceedingly small the business of manufacturing fittings was at that period.

The wrought-iron pipe and fittings industry originated in England in the 30's, previous to which time practically all steam pipes were made of copper, and even for some time after the introduction of wrought-iron pipe copper steam-piping was in very common use.

Until 1845 the only fittings in this country were the imported English wrought-iron forged fittings, which were used for steam, water and gas.

But about that year some of the importers and jobbers of English pipe and fittings in different parts of this country took up the manufacture of fittings in cast-iron and brass, the former being principally used for steam work and the latter for gas.

Soon after that the process of making malleable-iron castings was discovered, and as this was a success, the experiment then was tried of using malleable castings for fittings. These soon became popular and took the place of the English wrought-iron forged fittings and largely supplanted the cast-iron fittings. The brass fittings, however, continued to be used as late as 1856.

The first makers of fittings in this country were:

In Philadelphia:

Morris, Tasker & Co. (who made cast-iron fittings and valves).
Stanley G. Flagg & Co. (who made malleable-iron fittings only).

In New York City:

Nason & Co.
Norris & Gregg
Hunter, Keller & Co.
(all of whom made the entire line).

In Boston:

Walworth Manufacturing Co. (who also made the full line).

All of these firms appear to have started in this line of business at about the same time.

The fittings industry, of course, was then in its infancy, the total production of all these factories being quite small.

Neither the Walworth Manufacturing Co. nor any of the New York manufacturers had an iron foundry; and their shops were exceedingly small. Some of them had not over twenty feet of store front, the buildings being two stories and basement. Their factories were located on the second floor, the first floor being used for the store and office and also for carrying part of their pipe stock; the remainder of the pipe was kept in the basement.

What would these pioneers in the business have thought could they have known then the vast proportions to which it was destined to grow in one person's lifetime, and compared their small 20-ft. stores with our present array of buildings, which, if they could be placed in a row, would give fully a mile of stores and one and one-half miles of factories.

These buildings range from three to six stories in height and contain a total floor space of about three million six hundred thousand square feet.

OUR BUSINESS A SUCCESS FROM THE START

UP to this time we had gotten along flourishingly and had made money rapidly considering the size of our business. I might say here that I am confident we made money right from the day we started in business, which is rather remarkable.

Two fundamental principles are involved in the success of any business, viz.:

First: One must know how to manufacture the goods to advantage.

Second: He must understand how to figure the cost of his goods, in order to make prices that will secure orders and at the same time yield a profit.

PANIC OF 1857

OUR continued success thus far naturally led us to entertain great expectations for the future; but it soon transpired that we were doomed to bitter disappointment, for early in the summer of 1857 evidences of a panic appeared, and by autumn all business had come practically to a standstill. This state of affairs largely grew out of the fact that our currency in the West was based upon the bonds of the slave states, and the agitation of the slavery question made it evident that trouble was

likely to arise, which, of course, affected the bonds and through them, the currency.

This panic continued without any improvement until the breaking out of the rebellion in 1861, the depression in business being exceedingly severe throughout the whole country during that entire period.

As may be imagined, the panic found us in a rather expanded condition, owing to the extent to which we had been crowding and enlarging our business, and although our indebtedness was not large, we experienced the greatest difficulty for a year or two in getting our affairs into anything like comfortable shape. Often we had to call upon our uncle, Martin Ryerson, and other friends for assistance, and the amount of worry and anxiety that we suffered it would be impossible to measure.

As an illustration of the straits to which people were put during this period in the paying of their bills, I will mention two incidents that occurred in connection with our business.

A customer of ours in Chicago, by the name of Moses, and another customer in Burlington, Iowa, named Hendrie, both of whom were in the machinery business, were owing us money, and when I called upon them to collect the accounts, they stated they had no cash, but that I might look around their places and if I saw anything there that I could make use of I was at liberty to take it.

The only thing I discovered that I thought I could make any use of was the pipe connected with their heating plants, and as they told me to take this, I did so.

It must be remembered that this was during an unusually severe period, when we were very hard pressed in our business, and the pipe obtained in this way enabled us to raise money with which to pay our debts.

The volume of business at that time was exceedingly small and the best business we received was from breweries in the way of orders for beer cocks (which articles we added to our brass finishing line). Frequently I drove about the city from morning until night without securing twenty-five dollars worth of business.

FIRST IMPORTANT STEAM-WARMING CONTRACT

THE first ray of light that came in the way of business of any importance was the steam-warming contract for the Cook County Courthouse, which we had the good fortune to secure in 1858.

This contract, amounting to $6,000, was the largest one placed in the West up to that time for this line of work, and the competition for it was very bitter, our rivals being Messrs. Walworth, Hubbard & Co., of Chicago, a branch of the Walworth Manufacturing Co. of Boston, who enjoyed quite a high standing in the steam-warming business.

The letting of the contract was in the hands of the chairman of the county board building committee, Mr. Franklin Sherman, owner of the Sherman House, who was an ex-mayor of the city and a very prominent citizen. He not only enjoyed the reputation of being an exceedingly honorable and fair-minded gentleman, but also possessed much business shrewdness. When Mr. Hubbard (of Walworth, Hubbard & Co.), knowing we were the lowest bidders, appeared before him and took decided grounds against us, claiming that we were incompetent to perform the work and endeavoring to make it appear that steam-warming was a highly scientific and complicated problem and that his firm was the only one that could be depended upon to do a good job, Mr. Sherman decided to investigate the matter for himself. The result was that he became satisfied as to our ability and awarded us the contract. As this turned out to be a very successful piece of work, it gave us quite a reputation and placed us in first-class position in that line of business.

Besides bringing us in some profit, this job also enabled us to work off a quantity of dead stock, thereby putting our finances in good condition, so that during the remainder of the panic we had no occasion to worry about financial matters.

WE BEGIN TO MAKE OUR OWN FITTINGS

IN the carrying out of this courthouse contract large quantities of fittings were required, which caused us to take up the manufacture of these goods, including globe valves, check valves, steam cocks, branch-tees and hook plates. This is especially worthy of notice, because it was where we started the line on which we finally specialized and which to-day is our whole business.

ILLINOIS PENITENTIARY CONTRACT

SHORTLY after this we obtained another large steam-warming job, this being the contract for fitting up the Illinois State Penitentiary, then being built at Joliet. This contract was placed in 1860 and was

the second largest steam-warming job in the West up to that time, and as the work involved some special features, it added considerably to our reputation in this line.

As we worked on this contract during the winter, the first payment was not due until late in the spring of 1861, and this was particularly interesting to me as it consisted of the first greenbacks I ever saw. The United States Government was then indebted to the State of Illinois for some supplies that had been furnished to the army, the payment for which was made in greenbacks, and we, in turn, received some of these in payment for our work.

The remainder of the history of the steam-warming branch of our business will be found in a separate chapter.

REVIVAL OF BUSINESS

SOON after the breaking out of the rebellion the government placed large contracts for infantry and cavalry equipment with saddlery makers in Chicago, which required brass fittings, such as plates, knobs, spurs, stirrups, etc., and we were able to secure a great amount of this work, which for a time was quite profitable and materially assisted in putting us on our feet.

After a while, however, Eastern manufacturers of this line of goods, who were engaged in it to a much greater extent than we, reduced prices to a point where they yielded no profit, and as our general business meanwhile had been improving, we did not care especially about this particular line and therefore gave it up.

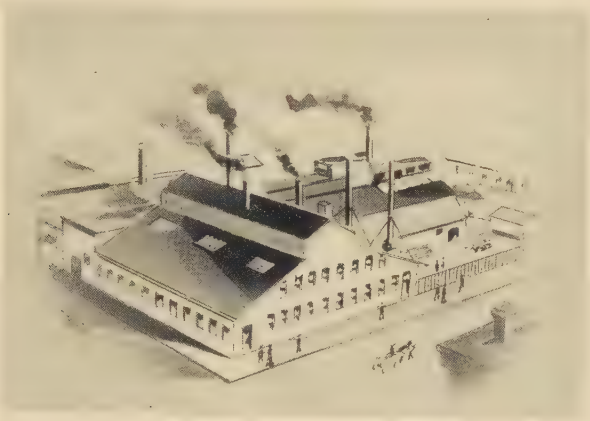
The enormous demand by the government for all sorts of material, made necessary by the rebellion, soon created a tremendous boom in business generally, and we went along flourishingly in all lines during that period.

ENLARGING THE FACTORY ON LAKE STREET

In 1862 we found that we had outgrown our facilities, in consequence of which we purchased the adjoining lot at No. 104 West Lake St., where we erected a building similar to the one at No. 102.

ENTERING THE IRON AND MACHINE BUSINESS

MY BROTHER having been an iron-foundryman, naturally found the iron business more to his taste than the brass, and as our business continued to increase and our consumption of iron castings became quite an item with us, we soon decided to build an iron foundry on ground that we leased at Nos. 52 and 54 North Jefferson St., which was separated from our premises at Nos. 102 and 104 West Lake St. by an alley. At the same time we started in a small way in the machine business, building steam pumps, doing jobbing machine work, and increasing the variety of our product in the iron-pipe line.



OUR FIRST PIPE MILL

MEANWHILE our pipe business had been growing very rapidly, and early in 1864 we decided to build a small butt-weld pipe mill. For this purpose we purchased 90 x 170 feet of ground at the northwest corner of Desplaines and Fulton Sts. and erected a mill, consisting of two butt-weld furnaces, which we operated continuously until 1905, when the property was sold.

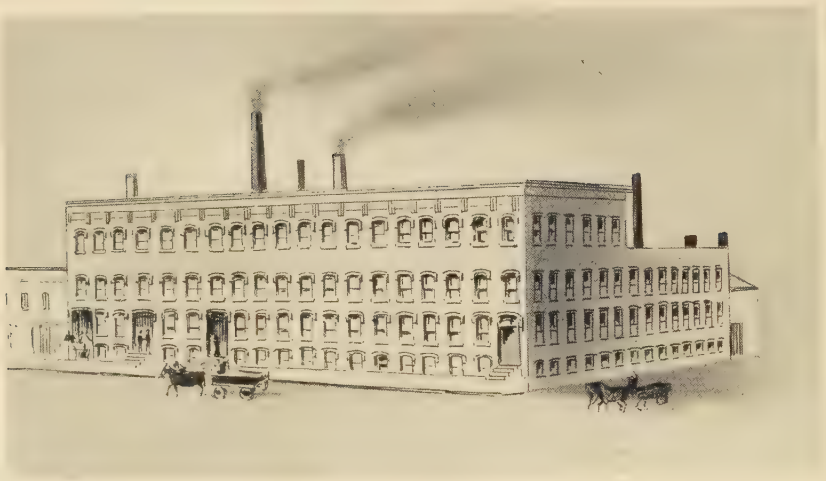
The building of this mill we considered a very important event with us, the manufacture of pipe being looked upon then as rather a high art, and as that business had been kept almost entirely a secret we experienced considerable difficulty in finding a competent man to build the mill for us. However, we finally secured such a person in Philadelphia and went ahead with the enterprise. A few obstacles were encountered before we could get everything into good working order, but they were not of a very serious nature, and soon the mill was in successful operation.

We found, however, that the man who built the mill for us would not make a good manager for the mill, and it was some time before we could get a capable person for that position. We finally did succeed in

doing so, and thereafter had no more difficulty in this respect, although we changed superintendents there several times.

This mill was a highly successful venture and made a great deal of money for us.

It is especially worthy of note that this was the first pipe mill built west of Pittsburgh.



FACTORY AT NO. 10 N. JEFFERSON STREET (p. 47)

SECOND EPOCH

ERECTION OF FACTORY AT NO. 10 N. JEFFERSON STREET OUR FIRST MALLEABLE IRON FOUNDRY

SINCE the demand for all our product had continued to increase very rapidly during the rebellion, we found, in 1864, that we again had outgrown our facilities, and we then decided that the great success which we had met with in our business warranted us in making a radical change and branching out on a very much larger scale, so that our business would be placed on a broader and more solid basis.

This we did by purchasing a piece of ground on the west side of North Jefferson Street between Randolph and Lake Streets, 154 feet front and running back 150 feet to the alley. On this property (known by us as "10 North Jefferson Street") we erected a brick building, which we have occupied continuously ever since.

This step was one of such great importance to us that I feel it ought to be quite fully described.

Those who have had experience in a rapidly growing business know that, through the natural way of enlarging it—that is, by adding to it from time to time—it becomes a piece of patchwork, and under such conditions the business cannot be satisfactorily conducted.

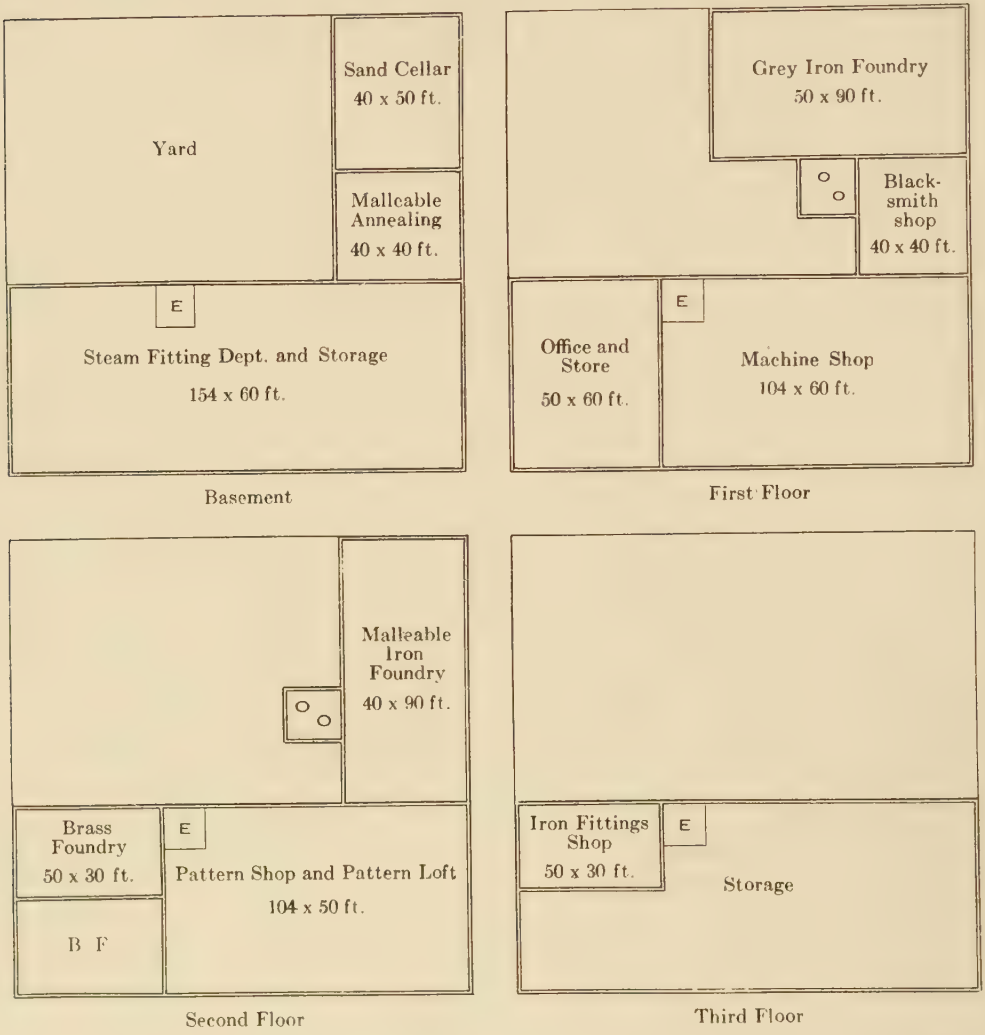
To start in to arrange a model factory for a complicated business such as ours and have it correct in all its details is not an easy matter even for a person of large experience, and the magnitude of the task is very greatly increased when the plant is located, as ours was, in the central part of the city, where land is expensive and it is necessary to make the most of what you have.

In order that this question may be better understood I would say that in planning this new factory we had to provide for the following departments:

Grey Iron Foundry	Pattern Shop
Brass Foundry	Steam Fitting Shop
Malleable Iron Foundry	Brass Finishing Shop
Malleable Annealing Dep't	Iron Fittings Shop
Machine Shop	Store
Blacksmith Shop	Office

To have all these departments of the proper size on this piece of ground 150 feet square, and to get them dove-tailed together so that all

could be operated to the best advantage, was the task that had to be worked out, and the following diagram shows how we arranged it:



This whole scheme was a most complete and thoroughly worked out arrangement; in fact, I do not believe a better plan could be devised for the kind and size of business we were then doing, and it answered our purpose perfectly until it was outgrown. Considering our limited experience in business at that time, I think the laying out of this factory was an exceedingly creditable piece of work.

It is interesting to note that this was the first malleable iron foundry to be built west of Pittsburgh. Also, as far as I know, this was the first

instance of an iron foundry being located above the ground floor.

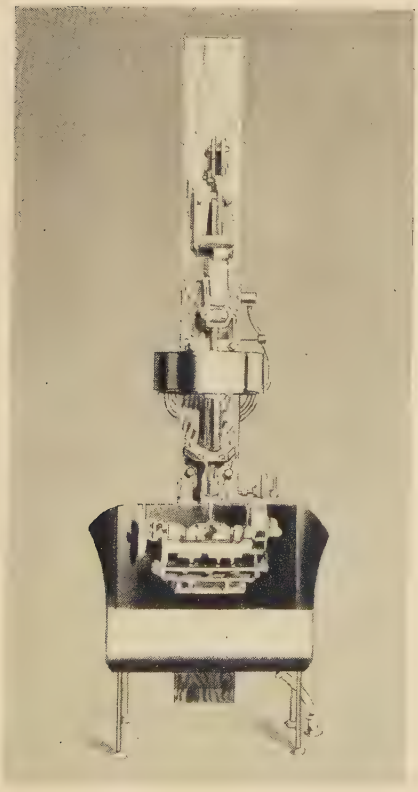
Not only did this new building and the arrangement of the shops answer our purposes admirably, but the fact that it was, as the cut on page 44 shows, a fine brick structure, gave dignity, stability and character to our business.

OUR ENTRANCE INTO THE FIELD OF MALLEABLE AND CAST-IRON FITTINGS MANUFACTURING

AS MENTIONED on page 41 we commenced the manufacture of fittings in 1858, at the time we had the steam-warming contract for the Cook County Court House, but we then made only a very few articles, —namely, branch tees and hook plates, flanges, and a few special goods, including brass globe valves.

But on the completion of our new factory at No. 10 North Jefferson St. in 1865, we entered upon the manufacture of a full line of fittings, both cast iron and malleable.

TAPPING MACHINES



UP TO a short time before we commenced making fittings the only tapping machine was the single tapper with revolving chuck (shown in accompanying illustration).

While the revolving chuck enabled the operator to cut accurately elbows, tees, crosses and practically everything else within the range of its power (which was 2-inch), it was a slow operation, as only one opening could be cut at a time.

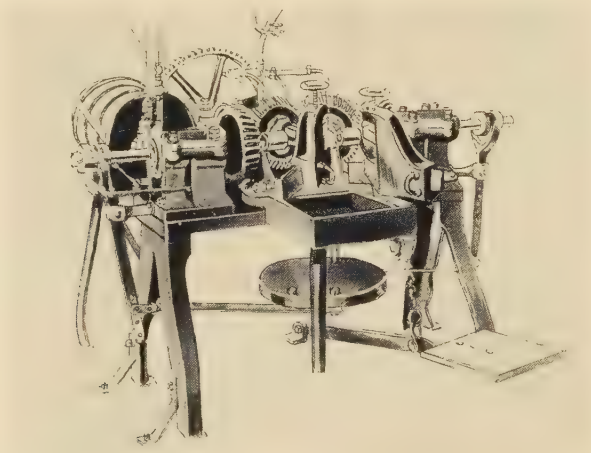
When we took up this line of business we bought one of these single tapping machines second-hand in New York City, and as we are still using it, probably it has been in continuous service for about sixty years. Although this machine is not now doing the regular work for which it was especially designed and which it was doing at the time we bought it, we always have found use for it, as in a business like ours there is a great demand for special fittings. This demand has now become

so heavy that, in addition to this old machine, we are using several other similar machines for this miscellaneous work.

It is a matter of extraordinary interest to look back and contemplate that these simple little machines tapped the whole range of fittings required in the business up to as late as about 1860, and then see the enormous machines we are using to-day with their tremendous power and endless variety. Some of these tap three openings simultaneously in a 12-inch fitting, whereas the little machine just referred to tapped only one opening in a 2-inch fitting, thus showing the enormous proportions to which this business has grown during a life-time.

INTRODUCTION OF THE THREE-WAY TAPPING MACHINE

A SHORT time before we commenced making fittings an important improvement in tapping machines was introduced, two different three-way tapping machines being brought out. One of these (which was originated by some men in Brooklyn) tapped the three openings in a tee in the same operation.



The other machine (invented by Mr. C. C. Walworth, of the Walworth Mfg. Co., Boston), although of different construction, accomplished the same results; that is, it tapped three openings at the same time, but the openings were in three different fittings.

He also devised a revolving chuck, which allowed one fitting to be inserted in the chuck while the others were being tapped, thereby affording considerable saving in time. This was looked upon as a very valuable improvement.

When we took up this line of work we built two three-way tapping machines for use in our shop, one tapping ¾-inch and smaller, the other tapping 1 inch to 2 inches.

In getting up these machines I invented the arrangement of two single chucks sliding at angles, as a substitute for the Walworth revolving chuck.

This answered every purpose exactly as well as his and put us in as good a position to manufacture these fittings advantageously as the Walworth Company were, and much better than all other manufacturers.

Upon showing my machine to Mr. Walworth when he afterwards visited Chicago, he remarked that he thought I had gotten around his invention in a very clever manner.

These machines cut not only our malleable, but also our cast-iron fittings; but, although their total capacity was only one thousand pounds of fittings a day, this move on our part in getting into the fittings business to this limited extent created a very strong feeling against us among the Western manufacturers, which resulted in a bitter warfare that continued for many years.

At that time the demand for fittings above 2-inch was so limited that no one was justified in getting up a machine to thread the larger sizes, for which reason they were cut in a lathe, and this practice continued with us for a long time.

We were now manufacturing practically a full line of fittings, and our equipment consisted of the following machines:

The two three-way tapping machines.

The one small, second-hand, vertical machine (which did the smaller miscellaneous work, such as flanges, bushings, branch tees, etc).

One lathe (on which we did the miscellaneous larger work).

This equipment, which was fully as good as that possessed by any one else in the business, together with our pipe mill previously mentioned (which made pipe up to 2-inch) placed us in a position superior to all others in our line of business and answered the demands of the trade for quite a number of years.

FOSTER TAP

AS a matter of interest in connection with the fittings business and to show the progress that had been made in this line at that time, I think the Foster tap is worthy of mention here, as it was quite an important and clever invention.

In this tap (which was devised by a man named Foster, of Brooklyn), the cutters worked in an angle slide placed in the barrel of the tap, these cutters being so arranged that by taking hold of two handles, after the

thread had been cut in the fitting, the cutters would slide in these angles, thereby contracting until they cleared the thread, when they were lifted out of the thread without stopping or reversing the machine, thus making a great saving in time.

We used these taps in various sizes for many years.

Since the introduction of the Foster tap a variety of collapsing taps have been produced, which were designed for certain kinds of work for which the Foster was not adapted, but they had no other advantage over the Foster tap.

MALLEABLE IRON JOBBING BUSINESS

Our malleable iron foundry was started primarily for the purpose of enabling us to manufacture malleable fittings and thus give us a complete line of fittings; but in order to make the fitting blanks to advantage, it was necessary to have the foundry of much greater capacity than would be needed to provide for the comparatively small demand which then existed for these fittings, and therefore we went into the general jobbing of malleable castings so that our foundry might be operated profitably.

ORIGIN OF THE MALLEABLE IRON CASTINGS BUSINESS

WHEN we took up this business the manufacture of these goods was rather a new art, probably having been known for not more than 15 to 20 years, and it was looked upon as quite a mysterious and scientific operation.

The originator of this line of work was Mr. Seth Boyden, of Newark, N. J., an account of whom was published in The Valve World for Oct., 1906; and as that city was the headquarters for this business, we of course had to look there for some one to assist us in getting started. It was our good fortune to secure an excellent man, and he started us off in an absolutely perfect and successful manner.

ADDITIONS TO OUR MACHINERY BUSINESS

We now were in a position to do a much larger business in the machine line and branched out quite extensively, taking on the building of engines and going more largely into the steam pump line; also making shafting and pulleys and doing general jobbing.

The first engine turned out by us was built in our old shop at No. 102 West Lake St. for running our new works at No. 10 North Jefferson St. This was a 10-inch engine, and was constructed on rather new ideas, —that is, it had an over-hanging cylinder, and a vertical cross-head working in slides that were bored out.

This was considerably more economical to build than any other engine on the market, and really was a step in advance in this line of business, but I do not wish to have it understood that we originated it. This style of engine was only adapted to the smaller class of stationary engine work.

Soon after that we went more extensively into this line and built larger engines, which will be more fully described later in this book.

As showing the history of our business a little more clearly, I would remark here that the first engine we put in was a 6-inch portable at No. 102 West Lake St. in 1856. This was outgrown a few years later and an 8-inch portable engine substituted for it.

Then, when we went into our new and greatly enlarged factory at No. 10 North Jefferson St., we put in the 10-inch engine above mentioned, and it is remarkable that this little engine answered the requirements of our greatly increased business for quite a number of years.

INCORPORATION OF OUR COMPANY

In 1865 we decided to incorporate our business and at that time changed the name to NORTHWESTERN MANUFACTURING COMPANY.

PANIC AT CLOSE OF REBELLION

SOON after moving into our new building at No. 10 North Jefferson Street the war of the rebellion ended and another panic arose.

In order that the general condition of business in the country at that time may be understood, it is necessary to explain that during the war the national currency which the government was compelled to issue as a war measure, to the exclusion of all other currency and gold, caused gold to appreciate tremendously (the premium on gold being at one time as high as 250), and this, together with the very heavy demand which the war created for all classes of material, caused an enormous inflation of values.

It was, of course, evident that, in event of the North being successful in putting down the rebellion, the currency necessarily would have to return to par and all materials shrink in price to the gold basis,—a process that was exceedingly slow and tedious, -and, therefore, as soon as it became apparent that this was going to be the outcome of the struggle, all buyers became extremely cautious about making any purchases beyond their actual requirements, the result being a very serious and long-continued depression in business.

As in the case of the previous panic, this one found us in quite an expanded condition, by reason of our heavy outlay for new factory and

pipe mill, in consequence of which we were again obliged to go through a hard struggle, and as the financial matters were in my charge, the bulk of the strain fell upon me.

For several years it was simply a case of borrowing from one to pay another. It is very gratifying, however, to be able to state that neither during that period nor at any other time have we ever allowed our paper to go to protest, which can be said, I believe, of but few other concerns that have been in business for so long a period.

END OF THE PANIC
EXPANSION OF OUR BUSINESS

The first two years of this panic were very severe and we found our new factory much too large for the conditions of business even in normal times, and as business was decidedly depressed in consequence of the panic, our factory was a great deal larger than we needed. For this reason we went ahead adding anything that we could make to advantage, and we also increased our lines of jobbed goods, as will be seen by the circular and catalogue issued by us in 1866. I am not sure whether this was our first circular, but no doubt the catalogue was the first one gotten out by us, and for this reason is mentioned here.

The question of catalogues is one that later on became a very important feature of our business, owing to the enormous development of the fittings business, and we went into it very extensively. A special feature will be made of this subject in another section of this book.

The principal items that we added to our manufacturing during the period above referred to will now be mentioned in detail.

ENGINES

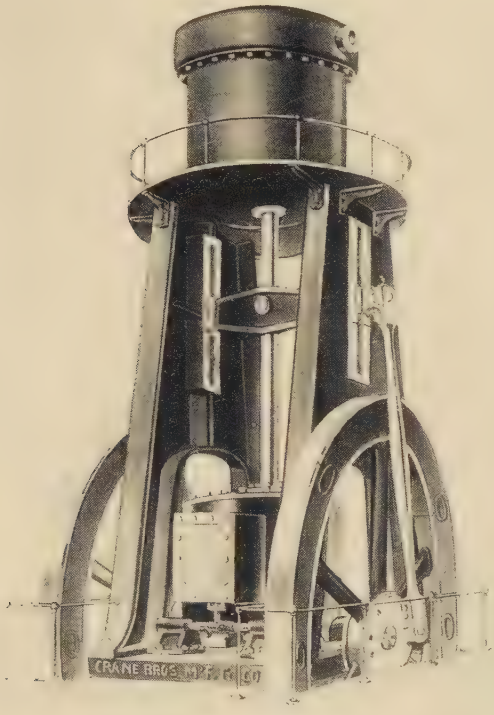
AT THIS time we commenced making larger engines, and it is worthy of note that we were the first to make engines with a balanced piston valve as a substitute for the slide valve.

This device (known as the "Tremain" valve, after its inventor) was taken up by my brother, who had great confidence in it, and although at first it met with much adverse criticism, its merits eventually became recognized, and it has continued to grow in favor up to the present time, thus confirming my brother's judgment regarding the invention.

We built quite a number of engines of this type as well as of the ordinary slide-valve pattern; also a number of double reversing engines for hoisting coal out of coal shafts.

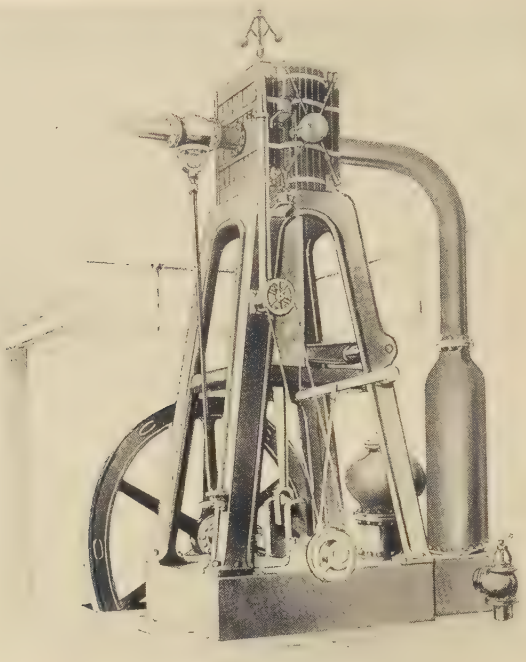
We also built several blowing engines for blast furnaces. Two of these were installed in a plant containing two blast furnaces which was situated near Archer Avenue on the south fork of the south branch of

the Chicago River, and another was placed in a furnace in Detroit. While these engines were small as compared with those of the present day, they were then looked upon as quite heavy work.

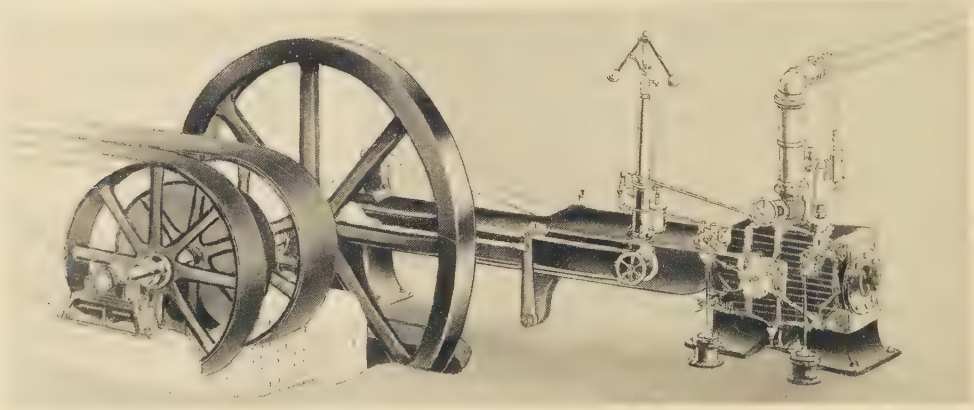


BLOWING ENGINE

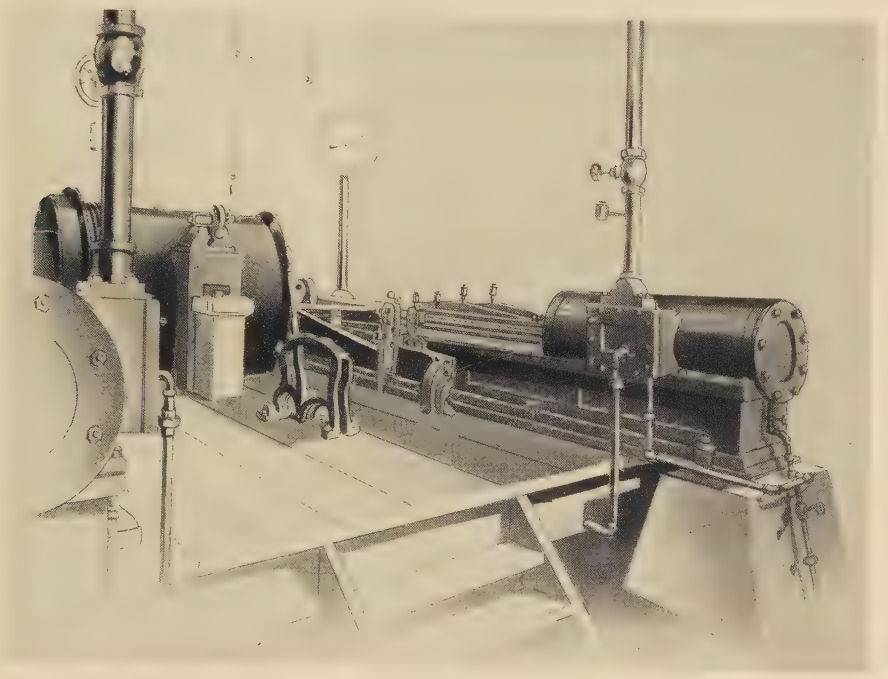
The two first mentioned were destroyed many years ago, as the furnaces were not large enough to produce iron economically. The one in Detroit,—shown above,—(owing to the fact that the furnace, though small, was a charcoal furnace) continued in use from the time it was built (about 1867) until 1902, a period of about 35 years, proving by this long service that it was a good engine.



Another engine built by us during this period that was considered a first-class piece of work was a vertical condensing engine, which was placed in Wright & Lawther's linseed oil mill on Polk Street, Chicago.



We also built a Corliss engine in 1879, which we installed in our own factory at No. 10 North Jefferson St., and it remained in continuous hard service from that time until July, 1910, when it was removed for the reason that we considered it more advantageous to buy electric current than to make our own power. Probably no better engine of this kind was ever produced.



A NOTABLE EXAMPLE OF THE SUPERIOR QUALITY OF ENGINES BUILT BY US DURING THIS PERIOD

A friend recently informed me that several months ago, when visiting an acquaintance who is connected with the Winona Coal Company, at Winona, Illinois, this gentleman stated that they had a double coal-hoisting engine which our company had furnished to his father in 1883, and which has been in constant use at their mines ever since that time and is likely to last twenty-five years more.

He also said that during the above period all the neighboring coal mines have had their second, and in some instances their third, pair of engines, and added that their company felt as if this engine was almost one of the family and that it certainly was made of good material.

Such information as this is highly gratifying and is further evidence that we did some good meritorious work in the line of engine building.

STEAM PUMPS

DURING this period we not only increased our manufacture of balanced wheel pumps, but took up the manufacture of the duplex balanced wheel pumps, both of which styles met with much favor and our trade in them was quite large. Our catalogue issued at that time contains cuts of these pumps; also reference to a large number of persons using them.

No doubt some of these pumps can be found in service at the present time. There is one of them now in use at Marshall Field & Company's retail store which was installed prior to the great fire of 1871, and it was understood at that time that this pump would have enabled them to save the building had not the destruction of the city water works cut off the supply of water.

FIRE HYDRANTS

Another product of our machine-shop was fire hydrants, of which line we made a specialty for many years.

VENTILATING FANS

In connection with the steam-warming and ventilating business we manufactured quite a number of ventilating fans, running from six to twelve feet in diameter. These were erected in brick work, the entire plans for which were prepared by us, and in every case proved entirely successful. This line was abandoned by us when we went out of the steam-warming business.

ENTERING THE ELEVATOR BUSINESS

IN THE year 1867 we took up the manufacture of factory freight elevators. This line was increased in 1869 by the addition of steam freight elevators, and in 1870 we made the further addition of blast furnace hoists. Then in 1872 we began the manufacture of steam passenger elevators.

Our business in these lines developed so rapidly that it soon required all the facilities that our limited room in the machine shop afforded, the result being that we were compelled during the next few years to gradually drop all the other lines that we had been manufacturing in that department.

The details of the elevator branch of our business are given in a separate chapter of this book.

MALLEABLE IRON CASTINGS

IN OUR malleable iron foundry, as previously mentioned, we went into the general jobbing work in malleable castings, and I will now give some particulars as to what this work consisted of.

At first we made castings for a number of agricultural implement builders.

After a while we took up the manufacture of plow clevises, the demand for which became so heavy that we made a specialty of them and carried an extensive stock. Our variety of these goods was very large, as will be seen by reference to the special circular which we issued covering this line.

Another article in which we did a very large business in those days was bung bushes for beer barrels. We built special machinery for threading these goods and turned out several thousands daily.

GREY IRON CASTINGS

IN THE case of our grey iron foundry the same conditions existed as have been mentioned in connection with the other portions of our business,—that is, we had considerably greater capacity than was needed for turning out the lines of goods we were then making, for which reason we made it a point to fill up with anything we could get, in order that we might run the foundry to the best advantage.

Among the goods made by us in this foundry at that time were sash weights and bed hooks, our variety of the latter article being quite extensive, as shown by the special circular issued by us.

We also made a variety of other castings.

BABBITT METAL

This was an important product of our brass foundry for many years, and as will be seen from the catalogue issued by us at that time, we made many varieties of this article.

TOOLS

In the early period of our fittings business we commenced the manufacture of dies and die plates, also common tongs, chain tongs and vises, all of which we still continue to make, as they belong to our regular line.

The panic previously mentioned, which commenced in 1865, continued to be very severe for the next two years, but at that time, as the currency had very largely appreciated, business commenced to improve, and for a number of years thereafter it was very good.

THIRD EPOCH

FURTHER ADDITIONS TO OUR PLANT

BY 1870 business had become so good that we found we again had outgrown our facilities, and in the Spring of that year we erected a four-story extension to our building at 10 North Jefferson St. running west on the south side of the lot.

The first floor of this extension we utilized for the enlarging of our store, which had become over-crowded, and our office was moved to the second floor.

The third floor we used for an extension of our brass business. The fourth floor was occupied as a pattern-loft.

In addition to the above changes, we at this time purchased the ground on North Desplaines Street adjoining the Jefferson Street property in the rear, where we erected a substantial four-story building 130 x 80 feet, which we still occupy.

Our experience with our malleable iron foundry on the second floor of the Jefferson Street building having convinced us that it was a good place for such a foundry, and this business having outgrown our facilities there, we concluded to transfer the malleable foundry to the fourth floor of the new building on Desplaines Street, using for it this entire floor, which gave us three times our former capacity.

The annealing ovens were placed on the third floor, which was a new departure from previous practice. The remainder of the third floor was used for a stock room, where we kept our blank fittings and the malleable castings which we jobbed.

The second floor was used for our fittings tapping shop and the storing of finished goods.

The grey iron foundry having outgrown its quarters, we built a new one running along the alley on the north side of the lot the entire length of the Desplaines Street property and taking in part of the first floor of that building, which increased the size of the foundry two hundred per cent.

We then moved the blacksmith shop to the place formerly occupied by this foundry.

The brass foundry, which had occupied 30 x 60 feet on the second floor of the Jefferson Street building, was then transferred to the third floor of that building, and the brass finishing division, which had occupied a corresponding amount of room beside the foundry, was expanded to take in the old foundry space.

The machine shop also was given some additional room through the removal of the blacksmith shop (as already mentioned) to the old foundry building, and the transferring of our millwright work (which was quite a feature of our elevator business) from the main building on Jefferson Street to the former quarters of the malleable iron foundry.

By these changes and additions all of our departments were again placed in first-class, convenient shape, not only having sufficient room for their requirements at that time, but considerable surplus space in which to expand.

RETIREMENT OF MY BROTHER

DURING the Spring of 1871 my brother concluded to retire from the business, as he felt that his interest in it, amounting to about three hundred thousand dollars, was sufficient for him, and he suggested that I buy him out. This proposition was accepted by me with much regret and a contract was made giving me ten years in which to pay this indebtedness. I felt that he really was much better off than I, as he was retiring with what was then considered a very large fortune, which was drawing ten per cent interest, and thus was entirely independent and free from all cares, while I was burdened with this heavy debt and also had the responsibility of running the entire business. In fact, it seemed to me as though a mill-stone was hanging around my neck. This anxiety, however, soon passed away, as it was not long before I became confident of my ability to handle the business alone.

Fortunately we escaped the great fire which occurred that fall, and the large increase we recently had made in our facilities placed us in fine condition to take advantage of the heavy demand and consequent higher prices that the fire created for our products, in consequence of which I was enabled to pay my brother in full within about two years.

SUPPLYING THE CITY WITH WATER AT THE TIME OF THE GREAT FIRE

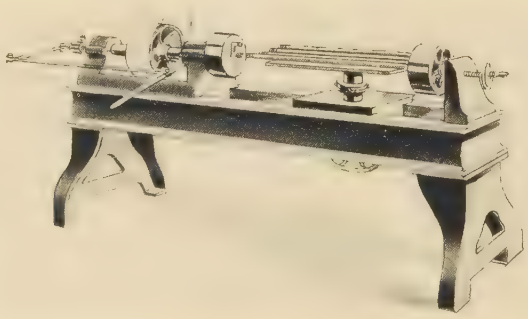
AT THE time of the Chicago Fire the only water works the city had were at the foot of Chicago Avenue, and as these were destroyed by the fire, the city was entirely without water. I suggested to the city authorities that we put in a number of our large steam pumps on the river and pump into the mains and in that way give them a little water. This proposition was accepted and we thereupon placed several of our larger pumps at the foot of Madison Street.

We obtained steam for these pumps from a locomotive and ran them continuously night and day until the city pumps were again running.

HEATING COILS

WHEN we entered upon the steam-warming business the heating surface for warming buildings consisted entirely of wrought-iron pipe in the form of coils placed along the outside walls. But about the year 1868 the manufacturers of steam-heating apparatus realized that the better class of work demanded something of a more artistic character, and in order to meet this demand they introduced box coils with iron screens and marble tops. Box coils were also made with ornamental straps, which answered the purpose very well for the plainer classes of work.

In time the demand for coils became so great that we made a systematic business of building them, selecting pipe that would cut with but little waste and keeping a stock of it ready for the different lengths of coils, as well as carrying on hand return bends tapped at various angles for coils of different lengths.



We also devised special machinery for screwing together sections of coils, as shown here.

RADIATORS

A FEW years after the introduction of box coils several people in the steam-warming line introduced wrought-iron pipe radiators, whereupon we took up the manufacture of this line and it was quite a feature with us for a number of years.

The history of the radiator business is more fully given in the chapter on steam-warming.

COMPANY'S NAME AGAIN CHANGED

We finally found that the name "Northwestern Manufacturing Company" was being applied to so many enterprises that it was quite confusing, and for the purpose of overcoming this objection and at the same time to again have our name identified with the business, we decided, in 1872, to change the name of our corporation to CRANE BROTHERS MANUFACTURING COMPANY, this being selected largely out of respect to my brother.

PANIC OF 1873

IN 1873 another panic arose which severely affected business throughout the country. We, however, had been enjoying such a flourishing trade for some time previous, largely due, as already explained, to the great Chicago fire, that we were in fine condition financially, and the panic had no immediate effect upon us, —in fact, we were continually increasing our machinery and the variety of our output in the steam fittings line.

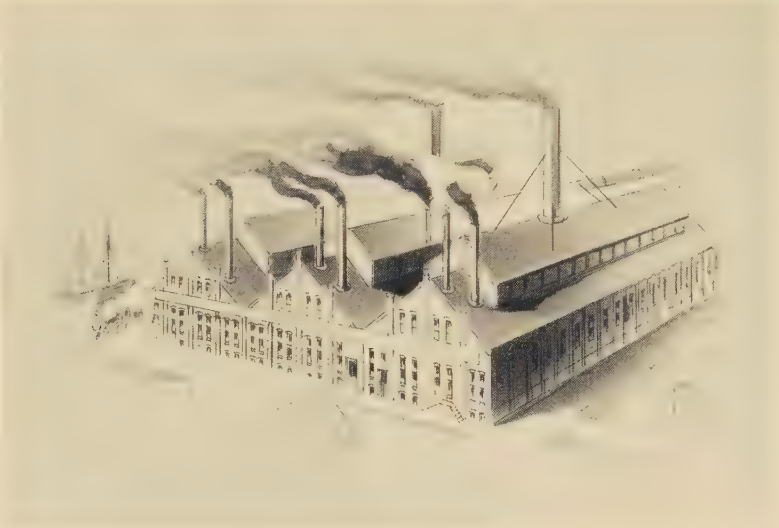
RETIREMENT FROM THE STEAM-WARMING BUSINESS

In the year 1874 we found that our sales of supplies to the steam-fitting trade had become so large that it did not seem quite fair for us to continue competing with them on contracts for steam-warming, and we therefore closed up this department of our business.

LATER EFFECTS OF THE PANIC

Although the panic which, as I have already mentioned, started in 1873, did not affect us at that time, we gradually came to feel its effect, as the depression in business continued until 1876. Our facilities already being quite large, we found it unnecessary during this period to increase them in any way; we simply ran along very quietly, without any special development in our business and experiencing no trouble as to our finances.

A slight improvement in business then began, which continued to increase until by 1878 it was very good and in 1879 it was again booming.



PIPE MILL AT JUDD STREET

IN THE year 1881 we built another pipe mill, which occupied 230 x 150 feet at Judd Street and the Fort Wayne Railroad tracks, and consisted of one lap-weld and two butt-weld furnaces.

At first we experienced a great amount of trouble with the lap-weld plant, all of which grew out of the blunders made by the technically-trained men whom I had employed as experts to arrange this mill for me; but finally we succeeded in getting it into beautiful running order, I think fully as good as any mill in the country at that time. We turned out here as high as one thousand lengths of 2-inch pipe in ten hours, which was then regarded as being the limit.

In addition to pipe, we also made boiler tubes on this furnace.

In connection with the construction of this mill there occurred another instance of my progressiveness which is perhaps worthy of mention.

Our first skelp furnace there was a failure, and a second one which we then constructed proved to be little or no better. Both these furnaces, which were modeled after furnaces made in the East, were very unpleasant to work and, even if driven to their limit, could not be made to heat the skelp fast enough to keep up with the welding furnace.

It then occurred to me to try a Siemen gas furnace with a tile bed, making it about the size of the welding furnace, but with only one-half that furnace's heating capacity, and this proved to be an immense success,

turning out with perfect ease all the skelp that the lap-weld furnace could handle.

I think this was the first instance of a Siemen gas furnace being used for heating skelp iron; at least none of the Eastern pipe men in our employ ever had heard of such a thing.

MY CONNECTION WITH THE PITTSBURGH TUBE COMPANY

AFTER operating this mill for four or five years (during which time it burned down and was rebuilt) we found that, while we had only one lap-weld furnace, and thus could produce but a small quantity of lap-weld pipe and boiler tubes, the Eastern manufacturers crowded the Chicago market so hard that we were unable to dispose of this product to advantage, and, as I was approached by some very successful iron manufacturers in Pittsburgh who were desirous of combining the pipe business with their business and was invited to join them with this mill, I decided to do so and put this machinery into a pipe mill in that city.

This latter plant was operated for a number of years, but owing to the bad management of my associates, it was not a success financially, and finally was closed down, in which condition it remained until 1899, when it was sold to the pipe trust that had previously been formed.

As the extensive additions that we made to our factory in 1870 (practically doubling its size) gave us a large amount of surplus room, which was not filled up for some time, and as we then adopted the policy of specializing on fittings and elevators, for which reason, when more room was needed for these two lines we commenced to throw out everything not connected with them, it transpired that our plant as re-organized in 1870 had sufficient capacity to carry us along for a period of sixteen years.

FOURTH EPOCH

INCORPORATION OF THE CRANE ELEVATOR COMPANY

IN 1886 we found ourselves in such a crowded condition that something radical had to be done in order to take care of our steadily growing business, and as the elevator work was an entirely different line from the remainder of our business, for which reason there was no occasion to run them together, we decided it would be better to separate them wholly from one another, giving each its own factory and management.

In carrying out this plan we purchased a piece of property 250x320 feet, on the west side of South Jefferson Street, between Van Buren and Harrison Streets, where we erected, for our elevator works, a four-story building 250 feet long and 60 feet wide, and at the same time incorporated our elevator business under the name of CRANE ELEVATOR COMPANY.

RE-ARRANGING AND ADDING TO OUR PLANT

This removal of the elevator portion of our business naturally resulted in our going through much the same operations we did at the time of the previous changes in 1870,—that is, moving the various departments around and re-arranging the plant.

The additional room thus gained, however, worked more particularly for the benefit of our brass department, little or no help being given to our iron fittings departments, and as this portion of our business had been quite active for years and was crowding our facilities, we concluded in the following year (1887) to do something to relieve these departments, for which purpose we converted the vacant lap-weld pipe mill previously mentioned into a three-story factory and built a fire-wall through the center of it.

We then placed the malleable iron foundry on the upper floor of the west half of this building and installed a cast-iron foundry especially for the smaller class of fittings on the upper floor of the east half, the tapping machines being on the second floor of the west half of the building, which arrangement gave us very much larger and more complete quarters for these departments of our business.

Castings for the elevator works and the larger class of cast iron fittings we continued to make in the old foundry at 10 North Jefferson Street.

In the Desplaines Street building (which was left vacant through the transferring of our fittings business to Judd Street) we then placed an additional brass foundry, this being located on the upper floor; and at

the same time we divided our brass finishing business, placing a portion of it, together with the tool division, in this building.

Through this re-arrangement and enlargement of our works we once more were in thoroughly good shape to manufacture everything the trade required in our lines.

FIFTH EPOCH

A PERIOD OF MOST EXTRAORDINARY GROWTH IN OUR BUSINESS

This epoch commenced with changing the name of our company to

CRANE CO.

UNTIL about 1890 the demand for fittings continued practically along the same lines as when we started, the only change being the gradual increase in sizes and varieties. But at this time we entered on an immense wave of progress in our business, which extended throughout the following twenty years, making this epoch decidedly the most important one in our history. While this covers a much longer period than any of the preceding epochs, the history of our business was so closely interwoven during this entire time that there is no point at which it could properly be divided.

This expansion in our business was largely due to the wonderful advantages that electricity was found to possess for distributing power as well as light, which created a demand for much larger steam engines, this in turn necessitating goods in our line of much greater size, running principally to flanged fittings. Previously flanged fittings had been used in an incidental way only and no one had regular patterns for them or carried them in stock, simply making one fitting at a time as called for. But now the demand for these goods grew quite rapidly, not only for larger sizes, but also for greater quantities, and in a short time they became a very important feature of our business.

METALLURGIST

REALIZING the importance of having a reliable line of this class of goods and knowing the immense variation that existed in the strength of cast-iron, this variation being as much as 100 per cent, we early determined to add to our business a metallurgist, and then we found that by great care and systematic work we could produce a uniform iron of 20,000 pounds tensile strength. So far as we know we were the first in our line of business to make any systematic efforts in this direction.

COMPOUND ENGINES

SHORTLY after this it became clearly demonstrated that the compound engine which had been experimented with for a great many years was a success and soon it was universally adopted for all large steam power plants. This led to the use of greatly increased steam pressures,

running as high as 250 pounds, which necessitated the production of a special and full line of extra heavy goods. These goods were also enormously increased in size, owing to the immense proportions that these power plants had attained, and we were required to get out patterns as large as 24 inches for this extreme pressure.

The supplying of these goods was a tremendous undertaking, involving, as it did, the making of such a vast number of new designs and patterns and it added enormously to the complications of our business. One peculiarity of this line was that it ran largely to gate valves, instead of globe and angle valves.

On account of the immense size of these power plants a break-down in them naturally would be an exceedingly serious matter, as it would be likely to throw out of commission a large part of the plant, thereby affecting a considerable portion of the community by cutting off its supply of electricity. Hence the engineers of these plants felt a great deal of anxiety regarding the strength of the cast-iron valves and fittings, not only on account of the increased size and pressure, but because of the fact that the expansion and contraction was much greater, due to the higher pressure, thus increasing the liability of breakage from this cause.

SEMI-STEEL

REALIZING the importance of this question, and knowing that the adding of twenty per cent of Bessemer steel to first-class pig iron would greatly increase its strength, bringing it up from twenty thousand to thirty thousand pounds tensile strength, and that the increase in the cost of the mixture was very slight, we concluded to make these goods of this material.

We now felt that, as we were putting on the market goods containing at least double the strength of some that were being produced by other manufacturers, we were on a really good, solid basis for supplying a first class article, and the engineers apparently were well satisfied with our product, no one having any trouble whatever with our material breaking. This step, of course, added still further to the complications of our business, as we now had to supply goods in ordinary cast iron and also in semi-steel.

SUPERHEATED STEAM ENGINES

THE great step in steam engineering last mentioned had just become well settled when the question arose of using steam superheated, which also had been experimented with for a long time and was claimed to be another decided improvement in steam engines. This was soon extensively adopted for large plants; and as the temperature of the steam in this case was increased several hundred degrees, it resulted in new

complications in the valve and fittings line for the following reasons:

First: It is a well established fact that cast iron, under such extremely high temperatures, will deteriorate.

Second: It added immensely to the expansion and contraction of pipe lines and correspondingly increased the danger of breakage of valves and fittings.

Third: Owing to the fact that brass expands and contracts more than iron, it soon developed that under such extremely high temperatures the brass seats and discs used in the valves became loose, and the first step was to find a metal that could be substituted for brass and so prevent this trouble.

NICKEL CASTINGS

TO overcome this trouble the use of nickel was suggested, which is a new metal that expands and contracts uniformly with iron and steel, is hard, durable, and non-corrosive; in fact, is in every way qualified to take the place of brass.

The art of making nickel castings, however, was far from being worked out to a practical basis in this country, the people here that were handling it apparently not having the proper knowledge of how to manipulate it, and we, like all others, experienced much difficulty in finding a way to produce sound castings. But as it had been longer in use and was better understood in Europe, we concluded to send our metallurgist over there to learn their process, and this he succeeded in doing.

It was, however, of no particular importance as applied to iron valves, as it was clear that iron valves could not be depended upon for the reasons already explained and that nothing but steel goods could be safely used for this class of work.

STEEL VALVES AND FITTINGS

THEREUPON we promptly entered into the manufacture of steel valves and fittings, and by applying the nickel seats to these valves we entirely overcame the trouble and anxiety previously mentioned and produced an absolutely reliable valve.

This added another decidedly heavy expense and complication to our business, as it was necessary to make a very large line of these goods, including not only valves and fittings, but headers of considerable size; also a great variety of special castings and special goods.

On taking up the manufacture of this line we found it impossible to obtain uniform and reliable steel castings (which were absolutely necessary for our valves), as the class of work ordinarily made by steel foundries

does not demand a strictly sound casting, for which reason these people had not given this matter serious attention.

We experienced so much trouble along this line that we found it necessary to take some radical steps in order to get a reliable article, and hearing that better steel castings were being made in Europe than in this country, we again sent our metallurgist there to investigate the subject. Upon his reporting this to be the fact, we then arranged to have one of the foreign experts come here and superintend the construction of a plant for us, and this turned out to be a great success.

We are confident that we are producing decidedly better steel castings to-day than are being made by steel foundries generally, thus enabling us to make steel valves of uniformly high quality, which fact is universally appreciated by steam engineers. As a result, this business has grown rapidly, so much so that we have specialized on it and formed a department for this line of work.

We feel that what we have accomplished in this whole line of high pressure, superheated steam, large, heavy work in the steam engineering piping line, including the Crane-lap joint, the welding on of flanges, welding pipe together and the making and finishing of bends, has put this work in a thoroughly reliable condition and placed our company absolutely in the front rank in all this line of business.

In the work of finishing the pipe we introduced a number of special machines for welding on flanges and making the Crane-lap joint, also facing machines for accurately facing both straight pipe and bent pipe.

ESTABLISHING AN ENGINEERING DEPARTMENT

NOT only did the business of manufacturing these goods grow immensely, but in order to obtain the best results from all these materials we went into the whole operation of producing all the heavy piping line of work, which made it necessary for us to establish an engineering department.

TURBINE ENGINES

BEFORE leaving the subject of steam engineering I desire to again briefly refer to the steam engine. Notwithstanding the vast improvements that had been made in steam engines, as previously mentioned, these were all brushed aside a few years ago by the introduction of the turbine engine, and this has become almost universally adopted for large power plants; but while this was a very important step in the evolution of the steam engine, it did not affect our business, as it made no change in the quality of goods in our line that are required for connecting the engine.

OTHER IMPORTANT LINES ADDED DURING THIS PERIOD

IN addition to producing the goods that we have just been describing, we added to our general manufacturing departments during this period (1890 to 1910) the following lines:

1st: A COMPLETE AIR BRAKE EQUIPMENT:

2d: A FULL LINE OF POP SAFETY VALVES

3d: A FULL LINE OF DRAINAGE FITTINGS

4th: A LARGE LINE OF AMMONIA FITTINGS

5th: A LARGE LINE OF STEAM AND OIL SEPARATORS

6th: A VERY GREAT VARIETY OF SPECIAL VALVES

In 1891 Mr. F. N. Winne, who had charge of our railroad sales department, reported that the railroad purchasing agents repeatedly urged us to make for them certain repair parts for air brake equipment,—such as couplings, cocks, etc., which they were constantly needing.

As there appeared to be considerable profit in these goods, we finally decided to accommodate the railroads and go into the manufacture of air brake repair parts, although this was a departure from our established policy to confine ourselves to the making of fittings.

We started out to make a few of these goods only, but as we were continually urged to make other articles and the business became rather attractive, we kept on adding to it until we were manufacturing a full line of these repair parts.

Finally, as some of our expert young men had become particularly fascinated with this business and thought they could get up devices that would answer the purpose just as well as the patented parts of the Westinghouse equipment, we allowed them to continue developing this line until they felt they had everything perfected for supplying a complete air brake equipment. We then decided to enter upon the manufacture of these equipments and started in supplying this full line to the railroads, as shown in our special air brake catalogue.

At the World's Fair in Chicago in 1893 we showed an equipment for fifty cars which was placed under working conditions. This exhibit was a very elaborate and beautiful one and attracted much attention.

But about that time Mr. Westinghouse, who was feeling somewhat uneasy over the position we were attaining in this line, suggested to us that we abandon the air brake business here and join him in the manufacture of this and other lines of goods in Russia, where a large field was opening for them. This we finally were induced to do and extensive factories were then established in St. Petersburg.

The adding of these various new lines to our regular standard fittings business—(which already was quite large)—was a stupendous task and increased the complications and magnitude of our business several hundred per cent.

Our special catalogues of air brake equipment, ammonia fittings, drainage fittings, power plant goods, etc., will give some idea of the extent of these additions to our business. The power plant catalogue issued in 1906, containing 397 pages 12x14 inches in size, was far in advance of anything ever turned out before in the way of a catalogue for our line of work.

NEW BUILDINGS

DURING this period the continued growth of our business necessitated from time to time further changes in and additions to our plants, the important features of which will now be mentioned.

NEW FACTORIES ON JUDD AND TWELFTH STREETS

NOTWITHSTANDING the very large increases made in our plant in 1886 and 1887, our business continued to grow so rapidly that within four years we again found we had outgrown our quarters and that radical steps would have to be taken to increase our manufacturing facilities, for which purpose we built, in 1891, a five-story factory, 212 x 90 feet on the north side of Judd Street east of Canal Street.

To this building we moved our cast iron fittings department, the foundry being placed on the fifth floor.

We also transferred the iron valve department to this building from 10 North Jefferson Street, thereby leaving the latter premises devoted entirely to the brass finishing business.

By the removal of the cast iron fittings department from the old building at Judd Street, we were enabled to again increase our malleable iron foundry by giving it the entire upper floor of the building.

This was a very important step with us, as it put our business for the first time into three grand divisions, each entirely separated from the others, viz.:

Malleable Iron Fittings Department,
Cast Iron Fittings Department,
Brass Department.

In the Spring of 1899 we saw that trade was likely to be very much better with us and as our manufacturing facilities again had become crowded very nearly to their limit, we decided to build another factory, which we erected on Twelfth Street immediately north of the Judd Street building previously mentioned. This was 230 x 90 feet, five stories in height, and much stronger than any previously built by us.

We then transferred our iron valve department to this new building from the Judd Street factory, which left the latter devoted entirely to cast iron fittings.

We now for the first time had our fittings manufacturing business divided into four distinct divisions, each complete within itself and having its own building, as follows:

Malleable Iron Fittings Department,
Cast Iron Fittings Department,
Cast Iron Valve Department,
Brass Goods Department.

UTILIZING THE OLD ELEVATOR PROPERTY

WHEN we sold our elevator business to the Otis Elevator Company in1895, they agreed to remain in the premises at 219 South Jefferson Street for five years, and when they moved out at the expiration of that period this large piece of property was left on our hands, which for a while we offered for sale or rent, as we believed we would have no use for it ourselves.

However, our general business continued to increase so rapidly that we soon found it necessary to provide more room, and therefore in 1901 we decided to transfer to these premises our flanged fittings, heavy pipe cutting, pipe bending and safety valve departments, together with a large portion of the pattern work from Department 3, Judd Street.

We also built an iron foundry there to which we moved the heavy class of foundry work that we had been turning out at the old foundry at 10 North Jefferson Street, thereby again making more space for the brass shop.

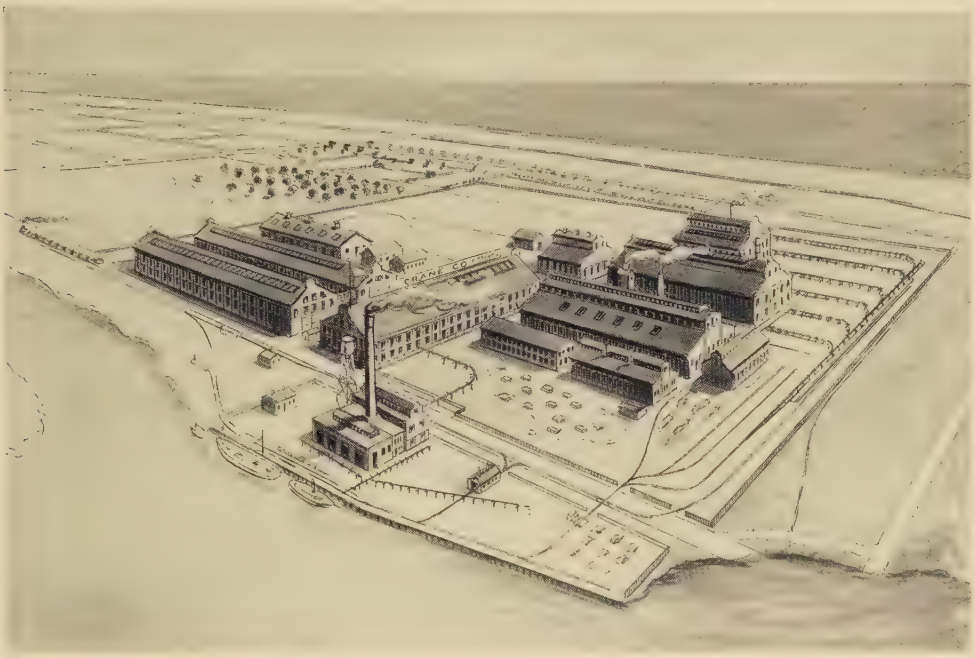
Our business now was separated into five divisions, the fifth being devoted to heavy cut pipe, flanged fittings and the special fittings belonging to the heavier steam engineering line.

At first we had more room than we needed at the 219 South Jefferson Street plant, but at this period our business continued to grow so rapidly that soon we were occupying the entire premises.

NIPPLE DEPARTMENT

IN 1902 we found that our malleable fittings department and the nipple manufacturing department (which was connected with it) had again become crowded, and we therefore moved the nipple department into the small factory building that we had purchased, which is located at Fourteenth Street and the railroad tracks. Here we have greatly improved the manufacturing of nipples, the old machines having been overhauled and standardized and devices introduced for champfering nipples inside and outside. We have also added a large number of wonderfully designed automatic nipple cutting machines, illustrated and described in the chapter on machinery. It will therefore be seen that this little department has been brought to a very high degree of perfection and it is quite an important branch of our business, the present daily output being fifty thousand nipples.

The above feature in our history is interesting as showing the magnitude of our business at that time, it then having developed to the point where we deemed it advisable to have a separate department for the manufacturing of so small a line as nipples.



BRIDGEPORT WORKS

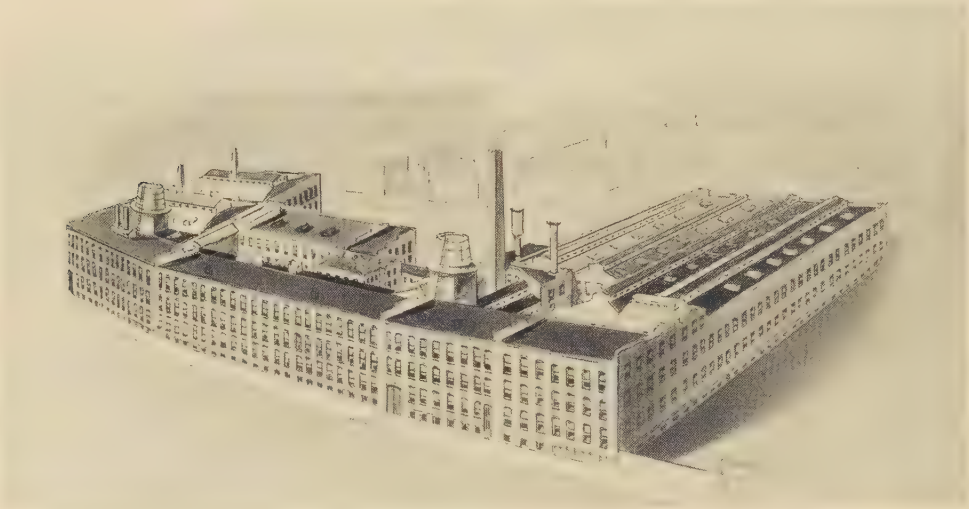
FROM the foregoing it will be seen that a tremendous increase had been made in our manufacturing capacity, and one naturally would suppose it would have taken care of our business for a long time. This, however, was not the case, for in 1903 we again found it necessary to take some radical steps to provide for our increased business in the East, and as the Eaton, Cole & Burnham Company, at Bridgeport, Connecticut, who had been in our line of business for many years, were disposed to sell out, we entered into a contract with them in that year for the purchase of their entire business.

Upon taking possession we found their factories were in a very crowded condition for the volume of business they were doing, and in order to put them into more businesslike shape we purchased a good sized tract of land adjoining the property on which they recently had built an iron foundry, and there erected a large number of buildings.

To this plant we moved the cast iron fittings cutting department and the tool department and added a malleable iron fittings department.

The removal of the cast iron fittings cutting department and the tool department from the old works left a large amount of room there for the expansion of the brass department. All of these changes gave the Bridgeport works a very fine range of factories throughout and placed them in a position to handle a very much larger volume of business than formerly. Our Eastern branches now are being supplied almost wholly from the Bridgeport plant, thereby greatly relieving the Chicago factories; in

addition to which Bridgeport supplies goods to some of the other branches and large quantities to Chicago.



BRIDGEPORT BRASS DIVISION

NEW PIPE MILL

HAVING (as stated in the early portion of this history) sold our pipe mill property in 1905, we at once commenced the erection of a new mill, 162 x 276 feet, on a block of ground we had purchased at Ogden Ave-

nue and Rockwell Street. This was a beautiful and perfect little mill, containing two Siemen gas bell furnaces and having about the same capacity as the old mill.

Within a year or two, however, we found that our business continued to grow so rapidly in the flanged fittings and heavy pipe line of work that still more manufacturing room was required.

Having no vacant ground, or sufficient time to make further preparations, we, in this emergency, concluded to shut down the pipe mill and utilize this building for the production of our heavy pipe line of work; that is, cut pipe, bent pipe, welded pipe, etc. We also added to this plant our bolt department, and continued to operate our coupling department there, the whole making a very fine and interesting factory and adding another division to our works.

The removal of this portion of our business from 219 South Jefferson Street gave us an abundance of room there for the expansion of the flanged fittings work and other lines that we were manufacturing at that plant.

In 1909 we found that the steel valve and fittings department was growing rapidly and adding too greatly to the complications of our iron valve department, and therefore we decided in that year to move it to 219 South Jefferson Street. Today we find that this plant has again become so crowded that steps will have to be taken at once to relieve it.

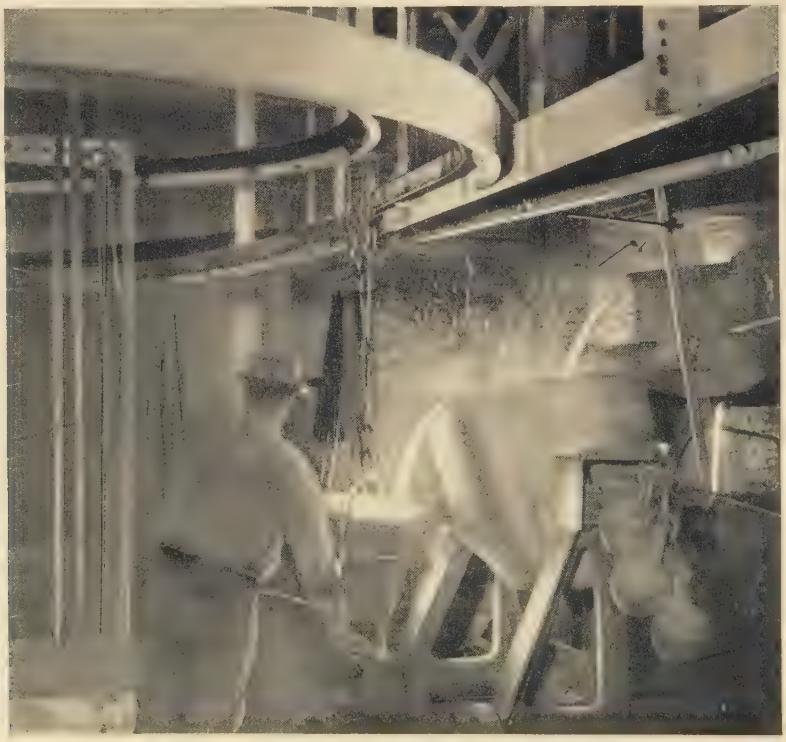
NEW MALLEABLE IRON FOUNDRY

WE NOW come to a new and important feature in our policy for conducting our business.

Owing to the fact that a very large amount of the machinery used in

our various shops has been designed and built by us, and therefore can not be bought in the market, the destruction of our works by fire would be exceedingly damaging, as much time would be required to rebuild both the shops and machinery. For this reason we concluded that it was especially desirable to have our manufacturing business in fire-proof buildings, and in 1909 we made a start in this direction by erecting at Fifteenth and South Canal Streets a five-story fire-proof building which is 225 x 177 feet, for our malleable iron department.

As this was to be a permanent factory, an immense amount of thought was given to the planning and arranging of it. In accordance with our former practice, the foundry was placed on the upper floor with the galvanizing department alongside of it, the annealing ovens being on the fourth floor. Here we introduced the mold carrying device in connection with continuous pouring, and continuous core drying ovens, also an immense amount of refinements of all kinds for the purpose of securing economical results in manufacturing and making the premises as sanitary as possible. For the latter purpose quite a number of exhaust fans are used to relieve the tumbling mills from dust and the galvanizing department from fumes.



CUPOLA IN THE NEW MALLEABLE FOUNDRY
SHOWING CONTINUOUS POURING

In planning this factory we have gone wholly into the use of electricity in driving machinery. All of the larger class of machines have individual motors, while the smaller machines are grouped so as to have only short lines of shafting. Another very important feature is the extensive application of compressed air for a variety of purposes.

In fact, it may be said that this factory is a perfect marvel in the amount of ingenuity, mechanical skill and engineering ability that have been shown in its development.

NEW FACTORY FOR A DIVISION OF
THE BRASS DEPARTMENT

IN CARRYING out our policy of getting the manufacturing portion of our business into fire-proof buildings, we erected, in 1910, a four-story fire-proof building (110 x 107 feet) at the southwest corner of South Canal St. and Twelfth Place (formerly Judd Street) for a division of our brass department.

The details of this plant have been worked out with the greatest care in order to economize operations all the way through, as well as to provide a light, airy and comfortable building, and without doubt it comes much nearer to being a perfect factory for its purpose than any other ever built.

OFFICE BUILDING

THE enormous expansion of our business during this period also caused a great increase in our office force, and to provide room for this portion of the work we erected, in 1905, an office building 100 x 94 feet, five stories in height, at the northwest corner of South Canal Street and Twelfth Place.

GROWTH IN OTHER LINES

In addition to the tremendous growth of our business that we have just been mentioning, all of our general lines grew enormously and provision continually had to be made for these.

Also, during this period we established about ninety per cent of our branch houses, which made an enormous demand on the home office for business ability in the purchasing of land, the planning and erecting of buildings, the systematizing of the business, etc.

EXECUTIVE FORCE

In carrying forward all of the above work the question naturally arises, where did we get so much executive talent that has been required for conducting this enormous business, and in explanation of this will say that until recently no systematic or thorough-going effort had been made by our company to produce this class of help, we simply having had an indefinite rule in regard to civil service, and our policy of treating our men

liberally having resulted in our surrounding ourselves with good men for the heads of our various departments.

These men have become intensely loyal and interested in their work, putting forth their best efforts at all times, as well as showing good judgment in selecting their subordinates, and we have made it a rule to place these subordinates in advanced positions when vacancies occur.

For example, when establishing a new branch house, we usually have chosen for its manager the salesman who had been representing us in that section. In almost every instance these men have proved highly satisfactory as branch house managers, and seldom have we been obliged to go outside to fill such positions.

Recently we adopted the plan of making a special effort to ascertain the merits of the important men comprising our executive force, in order to make sure that there are no weak places in the organization. In carrying out this plan, the various department managers make the president a written report each year concerning their important men, and the information contained in these reports is then entered in a book kept for this purpose, so that the records will show what the department managers have had to say from year to year regarding their principal men.

In this connection it is interesting to note that we not only have been well supplied with this class of help, but actually have had a surplus, as a few years ago we transferred to our Bridgeport plant thirty-three important men from our Chicago works without feeling the loss to any degree, everything continuing here just as well as before.

Considering this remarkable fact, and also that our mechanical and business men have been sought constantly by many of our rivals, it is evident that we are turning out not only first-class goods, but a great many high grade men, whereas our competitors appear to be unable to do either of these things very successfully.

I feel that among the many features pertaining to Crane Co.'s development that are complimentary to its management, this one is the greatest, as a strong organization is the most valuable asset any large and complicated business can possess.

It has been our policy at all times to avoid taking on outside help wherever possible, and to promote our own help instead. This I regard as an exceedingly important matter, for such a policy is a strong incentive to employes to take a greater interest in their work and endeavor to qualify themselves for promotion.

Nothing tends so much to demoralize a business as the bringing in of outsiders.

BRANCH HOUSES

HOW WE CAME TO START IN THE BRANCH HOUSE BUSINESS

IN THE year 1884 a jobber in Omaha, who was a customer of ours, became so embarrassed that he was unable to meet his obligations except by turning his stock over to us, and we concluded to take it; but as the freight had already been paid on the goods to Omaha and the bringing of them back to Chicago would entail considerable additional expense, we decided to try the experiment of running the store for a while ourselves for the purpose of reducing the stock as much as possible, so that only a small remnant would have to be returned here.

At that time we had no intention of continuing this permanently, but our experience while disposing of the stock was so satisfactory that instead of closing up the business we were encouraged to go on with the experiment, and after a while became thoroughly convinced that this scheme had great merit for our business.

While visiting Los Angeles two years later I discovered that, owing to a great real estate boom in that portion of the state, an enormous demand had arisen there for our line of goods, especially pipe and fittings, this demand growing out of the fact that real estate boomers were buying large tracts of land and platting it into lots, each of which had to have water.

On talking over with the jobbers there the question of supplying them with our goods, I felt sure that it would be impossible to make satisfactory arrangements with them, and as our experience in Omaha had impressed me with the value of a branch store, I decided to make a further experiment at this place.

This venture also proved very successful and after an experience of several years with this method of doing business, I became so thoroughly satisfied as to its value that I determined to make branch houses a permanent and important feature of our business, and to establish them as rapidly as our means would permit and favorable opportunities could be found.

ADVANTAGES OF THE BRANCH HOUSE SYSTEM

1st While the middleman may be a necessity in most lines of business, our experience with branch houses has demonstrated clearly that it is much better to dispense with him and transact business directly with the consumer.

The principal advantage of this branch house system is in saving the

expense of buying and selling goods between manufacturer and jobber—amounting probably to 3 or 4 per cent.

2d It gives us an absolutely reliable business.

At points where we have branch houses, instead of selling to but one or two large customers, as formerly, when we never could feel sure that they would continue trading with us, we now have from one thousand to two thousand small customers in the city and surrounding country, and while at times we may lose a few such customers, it is impossible for a competitor to make any serious inroads on this trade, the result being that we have a reliable business in those localities.

3d The great majority of consumers prefer to use one make of goods, and especially so where the goods are satisfactory to them, which they cannot be certain of obtaining when their supplies are procured from a jobber, for, as a result of his continually shopping around, his stock is sure to be a mixed one and therefore not at all uniform either in appearance or gauge.

In localities where we have branch houses and our company and its products are known, the consumers feel assured that in dealing with such branches they will receive a uniform line of goods, which gives us a strong hold on the trade as compared with the competing jobbers, and a small variation in price is no inducement to the customer to make a change.

4th The buying of outside lines of goods sold by the branches, all of which is done at the home office, where we have a thoroughly organized department for that purpose. Such plan is much less expensive than for each branch to do its own buying, and there is the further advantage that by purchasing in much larger quantities than a single store would do, we are able to obtain many concessions in prices, etc. Also, as we have in the purchasing department an expert whose duty it is to look after the quality of the goods bought, the branches at all times are assured that they will receive goods suitable for their trade.

By this method the branch house managers are entirely relieved of the labor connected with the buying of their supplies and thus can give all their attention to selling.

5th It relieves us of anxiety in the handling of our sales.

We have no particular difficulty in securing men of sufficient business capacity to manage a branch house, even where the sales amount to two hundred thousand dollars a month, whereas it would be impossible to find a man who could take charge of a business of a million dollars a month.

Although our business now is ten times larger than it was twenty years ago, we do not experience one-tenth the trouble and anxiety about our sales that we did then.

While our various branches have their own difficulties to contend with, I do not believe any of the managers worry much over these matters, and in Chicago we hardly know what it is to worry any more about our sales, our chief trouble being to keep up the supply of goods.

6th It is decidedly profitable.

While some of our branch houses lost money during the first few years of their existence, and some are still doing so, the great majority of them have made money from the beginning, the aggregate profit being considerable, and their position is continually growing stronger.

ECONOMICAL MANAGEMENT

IN CONDUCTING our branch houses we naturally have found it of the utmost importance to provide a complete system of rules for every feature of this work.

When starting a branch we first obtain, if possible, a piece of ground that is suitably located for taking care of the city business and at the same time has a railroad connection. If this can not be done, we get a store in the center of the city and then have a yard and warehouse in as convenient a location as possible and on a railroad.

The next step is the planning of the building. We have adopted fire-proof construction for all the larger class of branch stores and have settled upon a style of architecture of our own. We have fixed rules as to the strength of building, etc., and also have a systematic method of laying out the store and bins and for the arrangement of stock, offices and show rooms.

All of these features have been carefully and thoroughly worked out.

When we come to the running of these stores we have a complete set of rules and regulations that insure uniformity and thoroughness throughout. Our own forms of blanks and books are provided for all the branches, and the duties of the different clerks and managers are clearly defined. Then we have a general superintendent who has supervision over all the branches, and we also employ a branch house auditor.

Under this complete system, as soon as the force at a branch is broken in, everything runs like clock-work and with little or no trouble to the home office, and we think the business is operated in this way much more economically than when handled in the ordinary way.

All the expenses of each branch house are subdivided under different headings, and at the close of each year they are tabulated under their respective heads for the purpose of comparing the different stores. If anything is out of the way at any branch it will then be discovered and steps can be taken to ascertain the cause of the trouble and remedy it if possible.

In this way we expect to work the weaker stores up more closely to

the standard of the best and thus get the benefit throughout of the best management.

PARTNERSHIP BRANCHES

IN STARTING branch houses three different methods have been followed:

1st It has sometimes happened that in cities where we were not obtaining satisfactory business through the jobbers there was nothing left for us to do but to open a store of our own. This is a very expensive method as it compels us to fight our way tooth and nail in order to get established.

2d There are other instances in which we have bought out some one in our line of business.

3d Several of our branches have been the result of our joining with a jobber and entering into a partnership arrangement with him on an equal basis. In these cases we always have a contract which provides that in the event of the partner's death or of his desiring to retire from the business, he shall offer to sell his interest to Crane Co. on the basis of the inventory.

SUB-BRANCHES

IN CONNECTION with our branch house system we have found it desirable to establish a number of sub-branches, in each case placing the store in charge of the salesman who formerly handled that territory. The object of establishing a sub-branch is to better handle the business in a town which is somewhat of a trade center and is quite a distance from the main branch, and especially where it is in a growing country.

In starting a sub-branch we first secure a warehouse, and then ship in the most staple goods by the carload for distribution in the town and surrounding territory. This is a much more economical method of placing the goods in the hands of the consumer and also results in quicker deliveries.

Another advantage of the sub-branch plan is that, by locating in a place in this inexpensive manner, we obtain a hold on the trade and grow up with the town, thereby avoiding the competition that otherwise we would meet with later.

Since our first experiment in the branch house line we have established forty-two regular and sub-branches, extending all the way from Vancouver to Boston, illustrations and descriptions of which will now be given.

LOS ANGELES

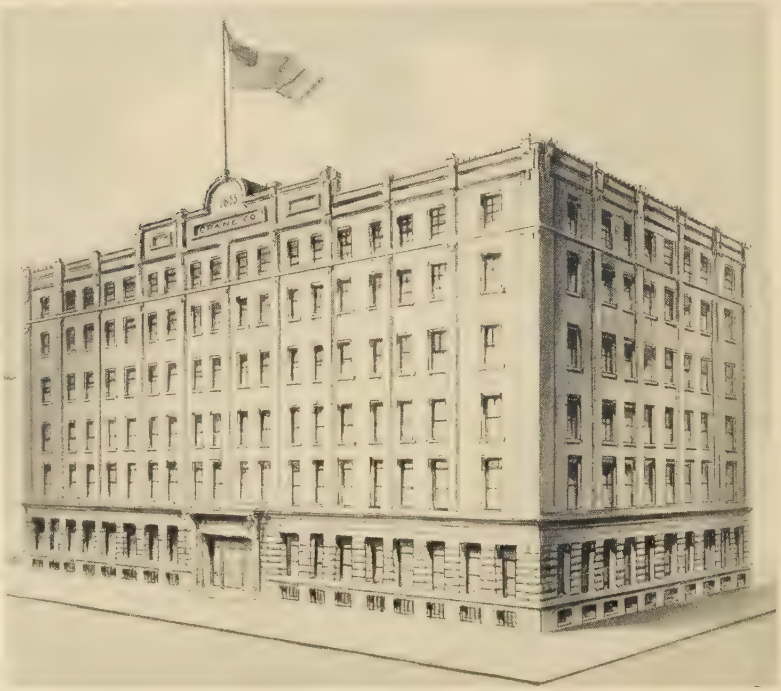
ESTABLISHED 1886

This property consists of two lots that are separated by an alley. The store is 88 feet front by about 98 feet deep and of fire-proof construction. On the other lot, which is about 100 x 200 feet, is a one-story building that is used for storage and pipe-cutting.

SAN FRANCISCO

ESTABLISHED 1891

Here we have two lots, each 160 x 206 feet. The store is 160 feet front by 84 feet deep and of fire-proof construction. The remainder of the lot on which the store stands is used for pipe storage and barn. About one-half of the other lot is covered by a one-story building that is used for storage and pipe-cutting.



OAKLAND

ESTABLISHED 1898

At present this branch occupies leased property consisting of a two-story building, 25 feet front by 100 feet deep, together with another piece of property containing about 50,000 square feet, one-half of which is covered by a one-story warehouse.

Plans have now been prepared for a new fire-proof store, 68 x 100 feet, (as shown above) which the company contemplates erecting on ground that it now owns. This is a sub-branch of the San Francisco house.

PORTLAND, ORE.

ESTABLISHED 1894

Size of lot, 100 x 200 feet. The store is 100 feet front by 100 feet deep. The remainder of the ground is occupied by a one-story annex which is used for storing and cutting pipe.

TACOMA

ESTABLISHED 1906

The store is 50 feet front by 92 feet deep. In the rear is a lot 60 x 160 feet, which is occupied by a pipe warehouse.

SEATTLE

ESTABLISHED 1902

The store is 108 feet front by 110 feet deep. In addition there is a warehouse lot 125 x 200 feet, which is used chiefly for storing pipe.

VANCOUVER, B. C.

ESTABLISHED 1908

The store is 93 feet front by 100 feet deep and of fire-proof construction. The front part of the building contains five stories and basement. The rear section has two additional stories owing to the fact that this portion of the lot is very much lower than the front.

SPOKANE

ESTABLISHED 1904

The store is 73 feet front by 58 feet deep. We also have a one-story and basement annex, 73 x 20 feet, that is used as a pipe and machine shop, and a pipe shed occupying 72 x 70 feet.

SALT LAKE CITY

ESTABLISHED
1902

Size of lot, 167 x 165 feet. The store is 84 feet front by 100 feet deep and of fireproof construction. The remainder of the lot is used for storing pipe and other material.

SACRAMENTO

ESTABLISHED 1910

Size of lot is 86 x 150 feet. The buildings on this property are of a temporary character.

NEW YORK

ESTABLISHED 1894

The store is 150 feet front by 50 feet deep. Across the street from the store we have a lot 75 x 100 feet, on which is a pipe warehouse; and adjoining this is a large piece of property which we rent and use for the pipe-cutting department.

NEWARK, N. J.

ESTABLISHED 1908

The store is 35 x 92 feet. This property is leased by the company.

PHILADELPHIA

ESTABLISHED 1890

The lot is of irregular shape, having a frontage of 29 feet and a depth of about 400 feet and measuring 185 feet in the rear. The store is of fire proof construction, 29 feet front by about 230 feet deep and 105 feet wide at the rear. The remainder of the ground is used for storage, stable, etc.

BALTIMORE

ESTABLISHED 1904

Here we have a number of lots amounting in all to about 100 x 300 feet. In addition to the store, which is 80 feet front by 90 feet deep, we have several other buildings, but all are of rather common character and doubtless sometime will be replaced by modern structures.

WASHINGTON, D. C.

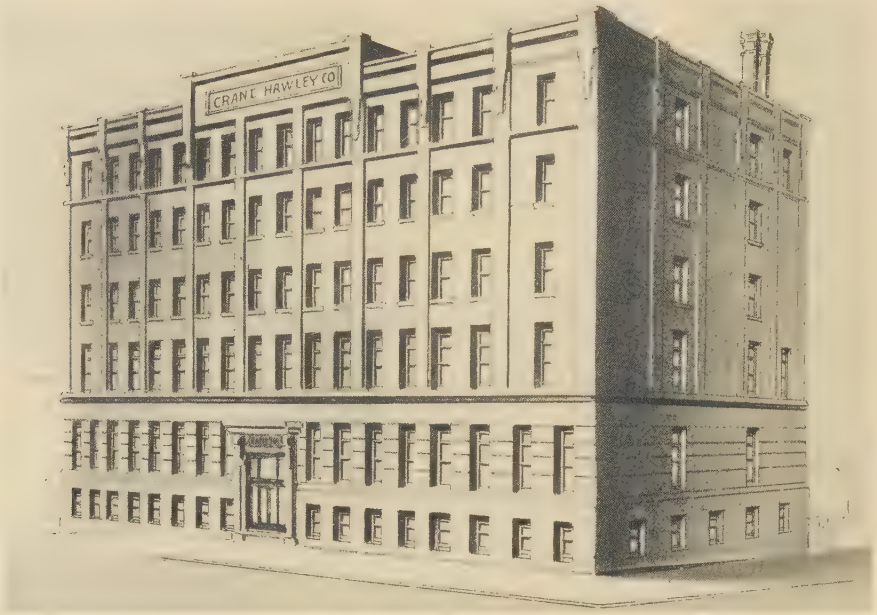
ESTABLISHED 1909

The store is 32 feet front by 142 feet deep. In addition we have a lot 63 x 135 feet, which is used for pipe yard.

BOSTON

ESTABLISHED 1906

The lot is of irregular shape, having a frontage of 101 feet and a depth of 296 feet and measuring 52 feet in the rear. The store is 100 x 100 feet and of fire-proof construction. The remainder of the lot is occupied by a machine shop and pipe shed.



CINCINNATI

ESTABLISHED 1899

The lot is 152 feet wide and from 145 to 284 feet deep. The store is 152 feet front by 90 feet deep and of fire-proof construction. The remainder of the lot is used for pipe-warehouse, etc. This is a partnership house and is incorporated under the name of CRANE-HAWLEY COMPANY.

DALLAS, TEXAS

ESTABLISHED 1904

Size of lot is 110 x 194 feet. The store is 84 feet front by 100 feet deep and of fire-proof construction.

MEMPHIS
ESTABLISHED 1904

The lot on which the store stands is 87 x 148 feet. The store is a fire-proof building 87 feet front by 100 feet deep. The remainder of this lot is occupied by a one-story annex. This branch also has another lot 74 x 74 feet, on which is a warehouse.

BIRMINGHAM
ESTABLISHED 1905

The store is 106 feet front by 150 feet deep. We also have several other large pieces of property here, some of which are used for warehouse and pipe-cutting.

ATLANTA

ESTABLISHED 1908

The building is 44 x 118 feet. This property is leased by the company.

ST. LOUIS

ESTABLISHED 1899

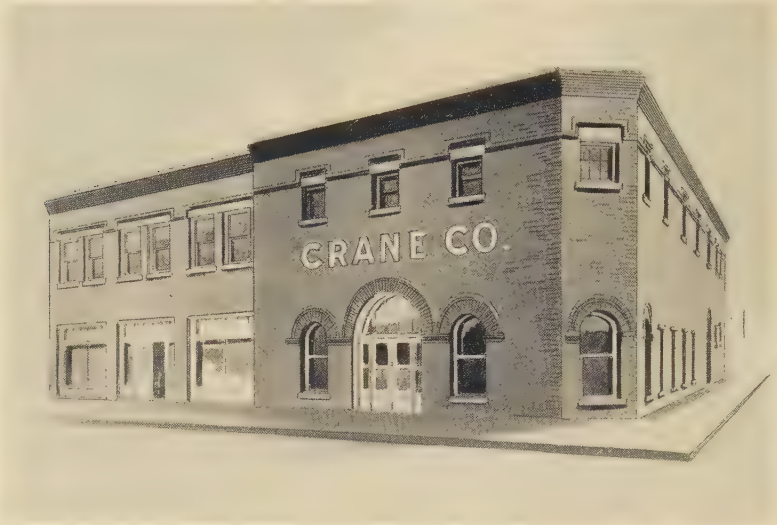
The store is 100 feet front by 122 feet deep. This branch also has a large amount of other property. The piece immediately in the rear of the store is used for storage and pipe-cutting, and along the railroad is another lot that is occupied by a pipe warehouse.

OKLAHOMA CITY
ESTABLISHED 1905

Size of the lot 127 x 140 feet. The store is 75 x 100 feet. This property is leased by the company.

WICHITA, KANSAS
ESTABLISHED 1908

The store is 50 x 130 feet. This property is leased by the company.



MUSKOGEE, OKLAHOMA
ESTABLISHED 1909

The lot is 144 x 114 x 106 x 110 feet. The store is 40 x 106 feet. This property is leased by the company.

KANSAS CITY
ESTABLISHED 1887

This branch has a large amount of property and is doing an extensive business. The details are omitted as the property is in a somewhat rambling shape, and no doubt within the next two years it will be straightened out and put in businesslike condition.

OMAHA

ESTABLISHED
1885

The size of the lot is 132 x 132 feet. The store is 128 feet front by 68 feet deep, and of fire-proof construction. The remainder of the ground is covered by a one-story annex 66 x 126 feet, which is used for warehouse, pipe-cutting, etc. This is a partnership house and is separately incorporated under the name of CRANE CO.

SIOUX CITY

ESTABLISHED
1897

The lot is 100 x 150 feet. The store is 68 feet front by 100 feet deep, and of fire-proof construction. The remainder of the lot is used for pipe storage, etc.

LITTLE ROCK
ESTABLISHED 1908

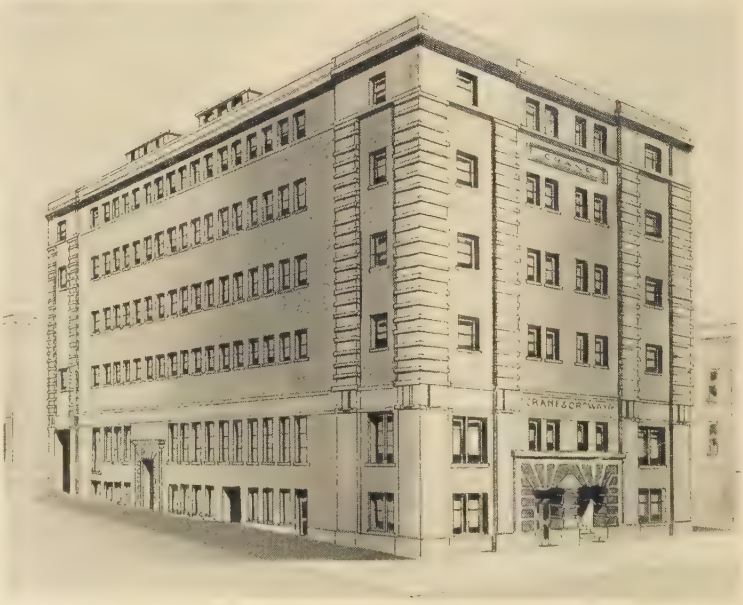
The lot is 150 x 150 feet. Store is 50 x 150 feet. This property is leased by the company.

ST. PAUL
ESTABLISHED 1893

The store is 145 feet front by 65 feet deep and of fire-proof construction. There is also an additional lot 150 x 119 feet, which is occupied by a pipe warehouse.

This is a partnership house, being incorporated under the name of CRANE & ORDWAY CO.

The stores in Minneapolis, Duluth and Winnipeg also are part of that company, in addition to which it has sub-branches at Aberdeen, S. D., Fargo, N. D. and Great Falls, Mont.



MINNEAPOLIS

ESTABLISHED 1892

Size of lot is 100 x 132 feet. The store is 100 feet front by 113 feet deep. This is a branch of the Crane & Ordway Co., St. Paul.

FARGO, N. D.

ESTABLISHED 1904

The store is 100 x 100 feet and is owned by the company, the lot being leased. This is a sub-branch of the Crane & Ordway Co., St. Paul.

ABERDEEN, S. D.
ESTABLISHED 1910

The lot, 80 x 140 feet, is leased. The store, 66 x 90 feet, is owned by the company. This is a sub-branch of the Crane & Ordway Co., St. Paul.

GREAT FALLS, MONT.
ESTABLISHED 1911

The lot and building, 40 x 250 feet, are leased. This is a sub-branch of the Crane & Ordway Co., St. Paul.

WINNIPEG
ESTABLISHED
1906

Size of lot, 180 x 171 feet. Store is 66 ft. front by 100 ft. deep. The remainder of the ground is used for pipe storage, etc. This is a sub-branch of the Crane & Ordway Co., St. Paul.

DULUTH
ESTABLISHED
1894

The store is 50 feet front by 95 feet deep. This is a sub-branch of the Crane & Ordway Co., St. Paul.

INDIANAPOLIS

ESTABLISHED 1909

Size of lot 185 x 196 feet. The store is 135 feet front by 85 feet deep and of fire-proof construction. The remainder of the lot is occupied by a pipe-shed and garage.

TERRE HAUTE, IND.

ESTABLISHED 1909

The size of lot is 100 x 110 feet. The store is 110 feet front by 49 feet deep.

DETROIT
ESTABLISHED
1911

The lot is of irregular shape, having a frontage of 101 feet and a depth of 296 feet and measuring 52 feet in the rear. The store is 100 x 100 feet and of fire-proof construction. The remainder of the lot is occupied by a machine shop and pipe shed.

KNOXVILLE
ESTABLISHED
1911

The store is 75 x 150 feet. This property is leased by the company.

DES MOINES, IOWA

ESTABLISHED 1908

The corner building is 22 x 66 feet. The adjoining building is 22 x 132 feet. This property is leased by the company.

DAVENPORT, IOWA

ESTABLISHED JANUARY 1st, 1912

The store is 172 feet front by 60 feet deep. In addition we have a pipe warehouse 60 x 108 feet. This property is leased by the company.

STEAM-WARMING

THE EVOLUTION OF STEAM-WARMING APPARATUS AND OUR RELATION THERETO

AT THE time we took up this line of business, a substantial start had been made in it, some good work having been done in the larger classes of buildings, such as insane asylums and the Capitol and post office at Washington; also some miscellaneous work in hotels, factories, etc. Very little, however, had been undertaken in the way of systematizing and nothing in refining the business.

In the smaller classes of work it was found that something entirely different was required, as some consideration had to be given to the appearance of the job; also it was necessary that the heating apparatus should work automatically, for in such cases people could not afford to employ an engineer to look after the plant.

Nothing in this direction had been attempted when we entered the field. Furthermore, the only rule we knew of at that time in connection with this line of business was one for proportioning the heating surface to the area to be warmed; namely, that 1 square foot of high-pressure direct heating surface would warm 150 cubic feet of air space, and this we found to be practically correct. Of course it was only a general rule and had to be modified according to the exposure of the room to be warmed.

ESTABLISHING RULES AND SYSTEMATIZING AND REFINING THE WORK

IT AT once became apparent to me that, if we expected to succeed in this line of work, not only would it be necessary to thoroughly systematize it, but that I should have to give this matter my personal attention; for it transpired that Mr. Hay (who, as previously stated, had been engaged by me as an expert to take charge of this work for us), was not very far advanced in it. He simply had been employed in the installing of steam-heating apparatus in the East in a small way, and had no talent for systematizing the work.

Furthermore, we were without his services for a number of years, for, upon the completion of our work at the Illinois State Penitentiary, Joliet (which, as elsewhere mentioned, was one of our earliest important contracts in this line), the men in charge of that institution were desirous of having Mr. Hay (who had been superintending that work for us) remain with them, to look after their engineering work, and business with us being quite dull, I granted their request.

Mr. Hay was with them for a number of years, during which time all the duties in connection with the management of this branch of our business devolved entirely upon me, and it was through my own efforts that every feature of the plans for the work was reduced to a correct system, thereby enabling me to accomplish exactly what I undertook to do. I think I may fairly say that I did more in the way of systematizing this work, as well as originating and developing good heating and ventilating systems, than has been accomplished by all other persons in this line of business even up to the present time.

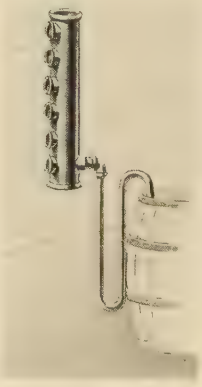
FIRST ATTEMPT AT ORNAMENTING STEAM-HEATING SURFACE

AT that period the only steam-heating surface was in the form of pipes placed on the walls of buildings and connected together with branch tees and hook-plates, these being used for all purposes, not only factories, but offices as well.

Our first attempt at improving the steam-heating apparatus was in connection with the Cook County Court House job previously referred to. Realizing that for this building branch tees and hook-plates as formerly made would be too plain, we introduced something much more ornamental, as here shown; that is, the branch tees were fluted and supplied with ornamental tops and bottoms, and the hook-plates were reversed, the strap being on the outside, which was somewhat more ornamental and capable of being touched up with different colors of paint.

These, when the pipes were bronzed, really made a very neat job.

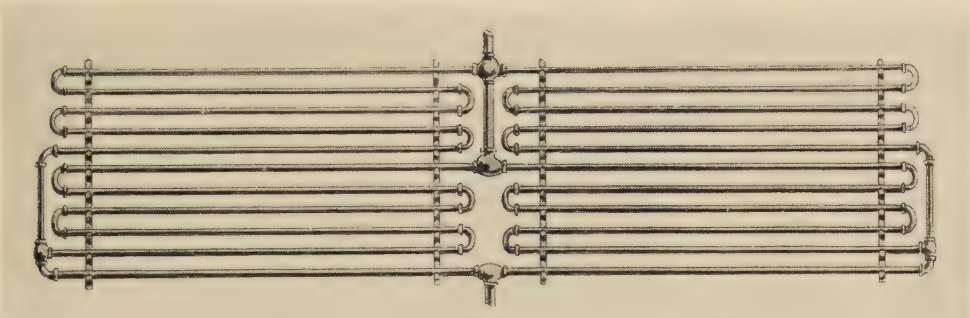
WATER SEAL IN RETURN PIPES FROM COILS



ANOTHER attempt of ours to improve this line of work was in taking care of the condensation in coils at our factory at 102 West Lake Street. These coils were supplied with steam from the exhaust, and the escaping steam from the drip was a great annoyance. To overcome this trouble I placed in the return pipes a water seal, consiting of a "U" shaped pipe about three feet long (see design) which really was a low-pressure steam trap. This allowed only the water to escape.

COILS IN CELL HOUSE AT STATE PENITENTIARY, JOLIET

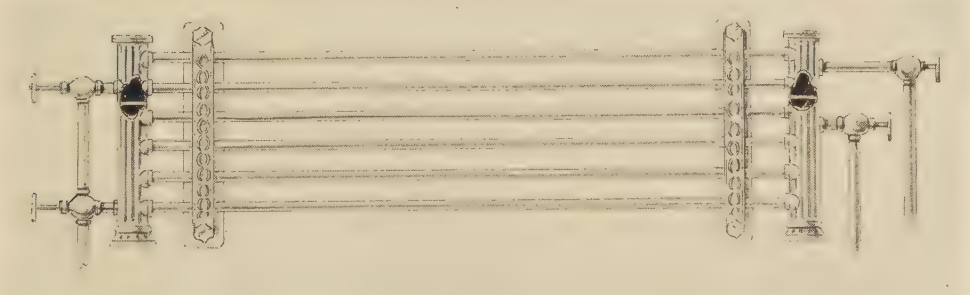
AS the cell houses were very long, I found that if we put in coils such as were ordinarily used for that class of work, they would be in form of "Ls" turned on the side and placed on the wall, which would be very unsightly. To overcome this objection I planned new return bend coils (shown below) which were symmetrical and made a much better appearance.



CONTROLLING THE TEMPERATURE IN ROOMS

THE next difficulty that I undertook to remedy was in connection with the controlling of the temperature in a room. With low-pressure, direct heating, —that is, the one-pipe system as largely used then and also to-day, —it was necessary to have practically the whole heating surface turned on, or else none at all. In other words, as much heat had to be used in moderate weather as was required for the coldest weather, which was very unsatisfactory.

I arranged to overcome this difficulty to a great extent by dividing a coil into two sections, as shown below, one section containing one-third and the other two-thirds of the coil. By this means I was enabled to use one-third, two-thirds, or all of the coil, as the weather demanded, which was a decided improvement. This principle we also applied to radiators.



INTRODUCTION OF AUTOMATIC LOW-PRESSURE, DIRECT STEAM-HEATING

THE first attempt in the way of refinement in steam-warming work for the larger classes of buildings was made by an Eastern firm, who planned and introduced an automatic, low-pressure, direct steam-heating apparatus, which they placed in the Brown School, Chicago, about the year 1860. This was about the first job of that kind.

By this system water could be furnished to the boiler from the city water supply through an automatic feeder, which insured its maintenance at the proper level in the boiler. Also, the boiler was provided with a draft regulator operated by the steam pressure, the draft closing when the steam reached a certain pressure. As this apparatus was so planned that the condensed steam returned to the boiler, but a very small amount of water had to be supplied through the feeder, and being thoroughly automatic, it required very little care and hence could be managed by the ordinary class of janitors, such as are employed in schools.

This was a very important step in the advancement of the art of steam-warming.

There was, however, a serious defect in this system, due to the return-pipes from the different coils being connected together and a check valve placed in the return from each coil where it joined the main return pipe. While the check valve prevented the stronger coil from backing up and obstructing the water in the weaker one, the excessive pressure of the stronger over the weaker coil prevented the discharge of water from the latter. That is, if the pressure was lighter in the coil than in the main return pipe, it was necessary for the water to accumulate until it became sufficiently high in the coil to overcome the excessive pressure on the other side of the check valve, and in order to get this pressure, there of course would have to be a large accumulation of water in the heating pipes. Then, when it did become strong enough to discharge it was likely to make quite a noise.

But the fatal defect in this arrangement was that when the steam had gone down, a considerable amount of water always remained in the check valve, and if frost got into the building this water would freeze; then when steam was turned on, the water that followed the steam could not pass through, and thus the whole apparatus would be put out of order. For these reasons the apparatus could not be considered as other than a most decided failure.

It was not long before an Eastern engineer, whose name I never knew, overcame the check valve defect by introducing a separate return from each coil to the water line in the boiler, thus sealing it and preventing one coil from backing up into the other, without the use of the check valve. This made the apparatus absolutely perfect.

In 1863 we obtained steam-warming contracts for the Haven and

Mosely Schools in this city, which we furnished with the above apparatus. In both cases it proved entirely successful, the apparatus being correctly planned throughout and hence the buildings were thoroughly warmed; the apparatus also was automatic throughout and perfectly simple in operation.

The Board of Education, which previously had experienced much trouble with hot air furnaces, was so highly pleased with the work of this apparatus that it adopted it as its standard for a number of years.

While I do not claim to have invented anything in connection with this apparatus, I do claim that we were about the first to put in a perfect low-pressure, direct, steam-warming system.

IMPROVEMENTS IN VENTILATION OF SCHOOL BUILDINGS

WHILE the heating apparatus just described was thoroughly satisfactory so far as warming buildings was concerned, it possessed the radical defect of furnishing no ventilation. At that time, however, the Board of Education had no ideas on the subject of ventilation, its only thought being to have the rooms warmed.

In 1867 I became satisfied that the question of ventilation of schools had been too long neglected, and as the Board of Education was about to let the contract for heating a new school building (the Dore School, on West Harrison Street, near Halsted Street) I went before the committee on buildings and grounds and protested against the fitting up of any more schools in the old way. I suggested that a portion of the heating pipes, in the form of box coils, be located in the basement, with the remainder of the heating pipes placed on the walls, as had been the practice previously, the purpose of the former being to supply the rooms with warm air and at the same time afford ventilation, while the latter were to be used only in extremely cold weather, when they would be needed in order to obtain the desired temperature.

The chairman of the committee, who did not possess sufficient intelligence to comprehend the subject, was determined to ignore me; but as I considered it a very important question, I was equally determined that I should not be ignored, and therefore went to Mr. T. M. Avery, at that time a member of the Board, and gave him my views regarding the matter. Mr. Avery coincided with me and made a noble fight in the Board on behalf of ventilation in the schools, the result being that the committee finally was defeated.

The chairman of this committee, feeling chagrined at my success in this matter, then went into a more thorough investigation of the subject and consulted a rival firm, by whom he was persuaded to adopt a well known plan employed in all large institutions, such as asylums, etc., which

consisted of the placing of all heating pipes in the basement and forcing the hot air into the rooms by a fan. It will be seen that in doing this the committee attempted to go much farther into the question of ventilation than I had proposed.

The contract finally was awarded to this competitor, our company not being the lowest bidder, and when the building was finished the committee complimented itself on having performed a great piece of work and secured a thoroughly ventilated school-house.

Soon after the completion of this building I visited it, in company with a member of the Board, to see the results which this committee claimed to have accomplished. The day happened to be mild, damp and muggy, and as we entered one of the rooms we at once noticed that the air was very foul. Upon investigating the matter we discovered that, owing to the mild weather, the room had become too warm and the hot air registers had been closed to shut off the heat, which, of course, shut off the ventilation. Instead, therefore, of having a well ventilated room there was no ventilation whatever.

MY IMPROVED REGISTER

On taking up the subject anew, to see how the defects in the Dore school apparatus could be remedied, I devised a plan for separating the heating from the ventilating, and invented a register by which the rooms were at all times supplied with a continuous flow of fresh air, that not only was heated when necessary, but to the proper degree to warm the rooms. The construction of this apparatus was as follows:

The cold air and warm air flues were placed beside each other, with a slide over their faces, so arranged that we could get all warm air, or all cold air, or air that was modified to any desired degree.

This is the only perfect ventilating apparatus ever devised, and it has been used exclusively in the schools here, as well as largely in schools in other parts of the country, with incalculable benefit to the health of pupils and teachers, but though I had what I believed to be a valid patent covering my device, I never asked for nor received any compensation from any one for its use.

RADIATORS

AFTER other manufacturers of heating apparatus had made a number of attempts to produce a satisfactory radiator, but apparently without complete success, we took up this subject and devised a wrought iron pipe radiator, which had return bends at the top and was put together with right and left threads. This was somewhat after the style of a radiator made in Cincinnati, but we had a feeling that this radiator as well as several others constructed on similar principles were

defective, in that all of the air was not removed from the radiator as the steam entered, and hence that the full benefit of the steam was not obtained.

MY RETURN-BEND RADIATOR WITH OPEN BASE

The objection just referred to, though more imaginary than real, resulted in my devising a return-bend radiator with an open base, which was divided by a partition at each end, one pipe being screwed into one side of the base and the other pipe into the opposite side of the base, and the two connected at the top by a return bend. When steam was admitted to one side of the base, the air was forced out of the pipes and into the opposite side of the base where it was drawn off.

This arrangement produced absolutely perfect circulation and caused the radiator to heat up promptly, in which respect it was an improvement over the style previously mentioned.

The open base also insured a more effectual action of the heating surface.

We now had a radiator which was entirely satisfactory, being durable, effective and ornamental, which are the great essentials in a direct steam-warming apparatus. This put us in a position to proceed with that line of business with the absolute certainty of being able to produce good results, and we made a great success of it, our apparatus being superior to anything made by others at that time, nor has it been improved upon to this day.

Our steam-warming catalogue issued soon after the introduction of this apparatus not only contains a description of it, but references to many buildings in which it was installed, together with certificates from our customers showing what they thought of it.

INTRODUCTION OF INDIRECT STEAM-WARMING

NOTWITHSTANDING the success met with by our direct steam apparatus, there was a growing demand for something better, as it was recognized that it was not in strictly good taste to have in first-class houses even such radiators as we were making; also there was some objection to this system because it did not afford ventilation.

About this time there was more or less experimenting with indirect heating apparatus, both steam and hot water, and the former had not met with much success, while the latter was received with considerable favor. It was the prevailing opinion, however, that if a good steam apparatus could be devised, it would be more satisfactory than anything else, and we undertook to find a remedy for the defect in it, this consisting mainly, if not wholly, in the danger of the coils freezing.

Some manufacturers had attempted to overcome this, but only in a

sort of half-way measure, which was unsatisfactory, and when we took it up we conceived the idea of reversing the feeding of the coil, that is, feeding from the bottom instead of the top, so that the condensed steam would be continually returning to the boiler through hot instead of cold pipes, as was the case under the old method and when the apparatus was first being warmed up. That is to say, the steam came very slowly into the top of the coil when the fire was started, and the coil being intensely cold, the condensed steam would freeze before the heat could get through. But feeding from the bottom completely overcame this trouble, and this, of course, was the foundation of a successful apparatus and led to its extensive introduction.

I can say about this as I did about the direct steam apparatus, namely, that it was the first absolutely reliable indirect steam-warming private house system ever produced.

Our steam-warming catalogue previously referred to shows a number of jobs of this kind that we put in; also certificates from the customers.

REFINEMENTS OF PRIVATE HOUSE WARMING

HEATING SYSTEM IN MY OWN HOUSE

BEFORE leaving the subject of private house heating I will say something further along the line of what might be called the refinements of warming and ventilation for private houses. I do not claim any particular skill or invention in this work; what I did was the result of my observation and understanding of the importance of having everything as nearly perfect as possible.

In producing the two apparatuses previously described, the only thought was to properly warm the house and at the same time to have an apparatus that was automatic, smooth working, reliable and economical. At that time we were satisfied to accomplish these things.

The following description of the heating apparatus in my own house shows how far we went in the way of refinements.

This system consists of a combination of two apparatuses, viz.: steam and hot water indirect heating. The boilers are located in the stable and are connected with the house by a tunnel. The two systems of heating coils are encased in brick. The cold air duct connecting them is also built of brick, and is under the basement floor. Cold air is admitted from under the porch. This cold-air chamber is separated with a horizontal partition covering the whole area, and is perforated as fully as possible with openings. To these openings are attached bags made of cheese-cloth, through which the air passes in coming into the house.

From the foregoing explanation a very clear idea can be obtained of the general arrangement of this apparatus. The refinements to which I have referred above consisted of the following:

One radical defect in all private house heating apparatus is the size of the boiler, especially for large houses, for in order to have the boiler of sufficient size to warm the house in the coldest weather it made it exceedingly large for mild weather. In other words, to obtain a satisfactory fire the whole grate has to be covered, which soon causes the house to become overheated and thus not only is a great annoyance, but also a waste of fuel.

The main object in using two boilers was to overcome this trouble. As each of these boilers is only one-half the size that would be required if but one boiler were used, it reduces the trouble above mentioned fifty per cent.

I will now explain the object of combining the hot water and steam. It is my idea that when a small amount of warmth is needed, it can be more correctly distributed by hot water than by steam for the reason that if you undertake to use steam in the same way, the coils nearest the boiler are apt to receive a greater proportion of the steam than those farther away, and to get steam at the remote points of the house a much higher temperature must be maintained than is required for moderate weather. In very cold weather, however, my preference is to reinforce the hot water by using steam, for here we get something that is more effectual in its heating than the hot water.

To overcome the trouble from dust and dirt we first clean the air, by passing it through the cheese-cloth bags before entering the house. In order to have this work satisfactorily it is necessary to have a very large area in these bags, so that they will require cleaning but once a year. We find by actual experience that by the end of the year we get a bucket full of dirt from these bags.

Soon after moving into the house I discovered that coarse grit gathered in considerable quantities on the window sills, which, of course, meant that a large amount of finer or imperceptible dirt must be entering the house. This brought up a new and important idea in connection with this subject, namely, that there was an excessive amount of vacuum in the house. To correct this fault I had all but one of the fireplaces closed as tightly as was possible with ordinary arrangements, and even then found that we had enough vacuum for the working of the heating apparatus and also that it gave us sufficient ventilation.

In order to determine the amount of vacuum in the house I devised a gauge, which consisted of a plate with a thimble having a half-inch hole through it and going through the window sash. A clapper three-quarters of an inch square made of two thicknesses of writing paper with two threads between them, forming a hinge, was fastened to the upper part of the plate so that it came over the one-half inch hole. In cold weather, say about zero, we found this paper clapper would take an angle of about 45 degrees, which can be depended upon as sufficient vacuum for all purposes of warming and ventilating.

A further source of dirt and annoyance which seems to be quite universal is the soiling of the walls by air streaming up from the registers, especially where they are placed in the walls. I think it likely this trouble would have been very slight with my apparatus, on account of the above improvements, but in order that we might feel sure on this point I had a hood placed over each register, which had the effect of throwing the air away from the wall. As a result our walls over the registers are not soiled a particle.

Another small feature introduced by me for the purpose of perfecting ventilation was the placing of a few small registers at the ceiling in different parts of the house, especially in the bath-rooms, which draw off a small amount of air at the top of the rooms.

HEATING AND VENTILATING OF PUBLIC BUILDINGS HAVING GALLERIES

OUR first job in this line of work that possessed novelty and special merit was the Central Music Hall, Chicago, erected in 1879 on the southeast corner of State and Randolph streets.

The great difficulty in buildings of this class —that is, where there are one or more galleries—is that, as hot air will always rise, by the time the lower portion of the auditorium has reached the proper temperature the upper portion will be altogether too warm. At that period this difficulty was still further augmented and the air greatly vitiated by reason of gas being used for illuminating, electric lighting having not yet been introduced.

Furthermore, the custom of admitting great volumes of warm air through large registers created disagreeable draughts where the registers were in close proximity to the audience.

To correct these defects I conceived the idea of letting the air in through a large number of small openings thoroughly well diffused and under the seats throughout the main floor, so that the warm and pure air would come almost directly in contact with the audience, and it was exhausted in the same general manner—that is, through openings well scattered throughout the building and at various levels.

To carry out this arrangement it was desirable to have a room occupying the whole space under the seating portion of the building, in order that the connection might be made to these various openings under the seats.

The next fundamental idea connected with this subject was to introduce the air at the proper temperature to warm the building and to maintain the temperature at the proper point in all parts of the building throughout the entire service, and without interrupting the flow of the air.

These results were obtained by having one large box coil of sufficient size to warm the building, enclosed in a chamber, and an arrangement of slides by which all the air required could be forced under the coil and warmed, or over the coil and not warmed, or partially through the coil, as might be necessary to bring the air to the proper temperature, the air being forced through by a fan into the chamber which connected with the small registers.

This apparatus was exceedingly simple and inexpensive and proved a great success, the air throughout the auditorium being at all times sweet and pure, without any disagreeable draughts, and its temperature varying but slightly in the different levels in the room. Of course there were some radiators around the foyer and corridors to make the apparatus complete. I regard this as the most perfect apparatus that can be devised for rooms of this character, and even today see no way by which it could be improved.

HEATING OF CHURCHES

AS every one knows who has paid any attention to this subject, the ordinary way a room is warmed, either by direct or indirect heat, is that the warmed air immediately rises to the ceiling. In other words, that we commence to warm from the top down.

In the case of the indirect method, the heat comes in and crowds the cold air from the bottom of the room out through the fireplace or a specially provided ventilating flue.

In directly applied heat, the warmed air simply rises from the radiator and the colder air strata takes its place, coming in contact with the radiator and being warmed in turn, thus producing a continuous circulation.

In either case, this arrangement, so far as warming an ordinary room is concerned, is the most natural and practically the only way it can be done properly.

But when we undertake to warm a large room having a very high ceiling—such as a church—it will be readily seen that this arrangement has a decided disadvantage, as we not only have to remove a large amount of cold air, but have to heat all the upper part of the building, not only the air but the walls and ceiling, before warmth can be felt in the lower part.

This is especially true when we take a building in a cold climate that has been unoccupied during the whole week. I understand that it is a common practice to begin Saturday morning to warm a church in order to have it heated in time for Sunday morning service.

This gives a pretty clear idea of the great difficulty that confronts us in warming such a building under the ordinary methods.

Realizing all these difficulties, we took a contract in 1873 to construct

an apparatus for heating the Trinity Episcopal Church at Twenty-sixth Street and Michigan Avenue, Chicago, in which the foregoing method of applying heat was reversed. That is, the heat was applied immediately to the entire floor, so that it was sent at once where it was needed, and it took but a short time to make the church comfortable.

The heating-pipes were run between the joists, and these joists were ceiled up with ceiling-boards, a cross cold-air duct being connected with each of these hot-air chambers.

Each pew had a number of very small registers directly under the seat, so that as the air came up it met the bottom of the seat and became scattered, avoiding any offense to the people in the church. It also was convenient for warming the feet, and the warm, fresh air came immediately in contact with the audience.

With this arrangement, of course there had to be the usual ventilating flues to carry off an amount of air equivalent to that brought in.

I believe this was the first apparatus of the kind ever put in, and I regard it as a highly successful piece of work.

There is one other matter in connection with the warming of such buildings that it would be well to speak of here, and that is the disagreeable currents that are created after the building has become partially warmed.

These down-currents against the large windows increase the colder the weather becomes. To overcome this objection in this particular instance, radiators were placed under all the large windows, which successfully counteracted the downward currents.

This also proved to be an exceedingly successful piece of work, and even after all these years I regard it as the height of perfection. No better device for warming a church could be produced.

A PARTICULARLY MERITORIOUS JOB CONTAINING SEVERAL NOVELTIES IN CONSTRUCTION

FIRST NATIONAL BANK BUILDING

SOUTHWEST CORNER OF STATE AND WASHINGTON STREETS
ERECTED IN 1868

THIS, although a comparatively small building, was the first fire-proof structure erected in Chicago, and as the architect took much pride in it and was exceedingly particular not to have it disfigured by the exposure of supply and return pipes, it became necessary, in arranging for them, to devise some method different from the usual custom in this work.

After considerable study, I hit upon the plan of running the vertical

main supply pipe up in one corner of the building, and as there was to be a galvanized cornice around the ceiling of the outer walls of the rooms, I concluded to place the horizontal supply pipes for the radiators inside this cornice.

The highest point of these pipes was at the main pipe, and the novelty of the arrangement consisted in having them fall around to the farther corner, this being contrary to the previous practice in low pressure work. From these horizontal pipes supplies were run to the radiators in the rooms above (this being what is called the "one-pipe system").

In each case the horizontal supply pipes terminated in a return pipe at the farther end of the building, which latter pipe ran down to a main return pipe under the basement floor and below the water line of the boiler, thus sealing it.

Another peculiar feature of this job was that, owing to the conditions in the basement, it was very close work getting the return water from the basement radiators back to the boilers.

In the first place, it was necessary to place the boiler in quite a deep tank under the sidewalk in order to have the water line of the boiler below the basement floor. Then, to obtain the benefit of all the head, which is only a foot from the bottom of the radiators in the basement to the water line of the boiler, I arranged to have the pipe that supplied the radiators on the first floor also supply those on the basement floor, running through a cross valve connected with the basement radiators and returning under the basement floor.

By having the supplies to the basement radiators of liberal size I was enabled to get the apparatus to work perfectly with this small amount of water line. This job not only contained quite a number of novelties, but was exceedingly neat and the apparatus worked perfectly.

THE IMPORTANCE OF EXERCISING GOOD JUDGMENT IN THE PLANNING OF HEATING APPARATUS

IN the steam-warming line, next to originating new devices comes the question of planning, arranging and constructing, for after all the rules and systems have been worked out, it is still a matter of very nice calculation to construct an apparatus that will work smoothly and to have the heating surface properly proportioned and placed so that it will warm the building correctly.

There are many features of the job for which rules can not be fixed, as there is such a great difference in various buildings, some rooms requiring four times as much heating surface as others in proportion to their area, and often the architect will demand that the heating surface shall be placed in such a way that the full results from it can not be obtained. For these reasons it is necessary to plan the apparatus to fit the job.

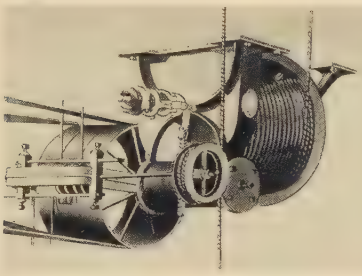
We met with wonderful success in the heating of buildings where the greatest possible complications and variations existed, but I shall not go into these matters here as they have already been fully covered in the steam-warming series published in The Valve World.

ELEVATORS

POWER FREIGHT ELEVATOR
FIRST ELEVATOR AND FIRST IMPROVEMENT IN THIS MACHINERY

IN 1867 we took up the manufacture of this style of elevator,—which was the only kind of power elevator in the market at that time, — and our first two contracts were with Bowen Brothers (a wholesale dry-goods firm on Randolph St.) and Hibbard & Spencer (who were engaged in the wholesale hardware business on Michigan Ave.).

The great difficulty with this type of machine was due to the fact that it required but a small engine to lift the load and therefore when heavy loads were being brought down they would run away with the engine.



To overcome this trouble, I had our people arrange the valve on the engine in such a manner that when a dangerous speed was reached the engine became a retarder instead of a motor. This was a very clever device which answered the purpose quite satisfactorily, and being my first improvement in elevator machinery, it is worthy of special mention.

OUR STANDARD STEAM FREIGHT ELEVATOR

BEFORE long a demand arose for a much better machine and one having considerably greater capacity, to supply which we designed, in the year 1869, the elevator shown on page 122.

From the first this proved a perfect success, and we had no occasion to make any change in it while we remained in the elevator business, nor have those who succeeded us altered it in any particular, which I look upon as being most remarkable.

Certainly it is a notable achievement to produce so complicated a machine as this one and have it absolutely perfect from the start.

The following patented devices were applied by us to this machine.

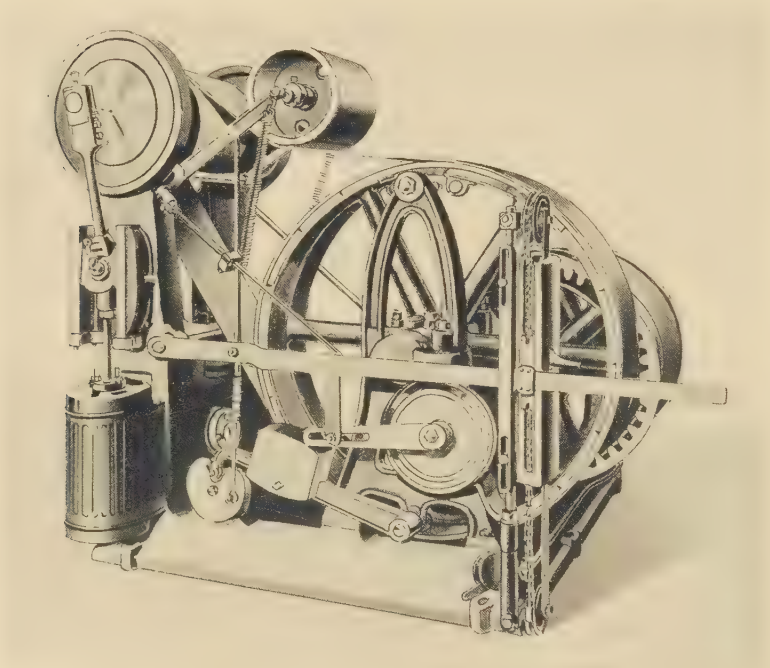
1st A combination of all the steam valves in one chamber. (My brother's invention.)

2d A combination of operating change valve and brake, by which the steam was shut off and the brake applied simultaneously. (Invented by one of our workmen named William Lavigne.)

3d An automatic stop motion for automatically stopping the car at the upper and lower landings independent of the hand or operating cable. (Invented by William Lavigne.)

4th The Apron Stop. This stopped the machine if the platform became obstructed by anything hanging over the hatchway, thereby preventing the cables from becoming unwound and thus getting into the gear and being destroyed. (My patent.)

5th The Brake Belt. This was a device for stopping the elevator in the event of a belt breaking. (My patent.)



From 1869 to 1871 we placed but two or three of these elevators, and they were destroyed in the great Chicago fire that occurred during the latter year. In the re-building of the city, however, a heavy demand for them arose, which continued as long as we remained in that line of business, and we installed a great many not only in Chicago but throughout the country. In fact, our machine became the standard freight elevator.

As proof of the durability and reliability of these machines, I will mention a few of those first put in by us, which are running perfectly today. The fact that they have been in constant service all this time without any expense for repairs certainly proves beyond any question that they were thoroughly well designed and thoroughly well built.

Marshall Field & Co.'s warehouse on Market St., Chicago. Three elevators installed in 1872. No repairs.

John V. Farwell & Co.'s wholesale store on Market St., Chicago. Six elevators installed in 1872. No repairs.

In both instances the information was supplied by the engineers who have occupied these positions ever since the elevators were put in, hence their statements may be depended upon.

OUR FIRST STEAM PASSENGER ELEVATOR
SPUR GEAR

WE COMMENCED building steam passenger elevators in 1872, and it was necessary to make but few modifications in our steam freight machine in order to adapt it to this service.

The principal change consisted in substituting cut spur gears for the internal cast gears on the drum by which we obtained a smoother motion of the car, and as a further aid in securing this result a fly-wheel was placed on the crank-shaft.

In addition to the patented improvements already mentioned in connection with our steam freight elevator, all of which were applicable to and necessary in this passenger machine, we purchased the patent covering a safety governor, which was designed to prevent the car from falling in case any portion of the apparatus gave way.

Then, as a further safeguard, we put on two cables instead of one, so arranging them that one was comparatively slack, thus throwing the work on the single cable, which had abundant strength for the operation of the car. In case it should give way, we would have practically a new and perfect cable to take care of the work. This is the first instance of the multiplying of cables and it was one of my own improvements.

The multiplying of the cables and the adoption of the safety governor, together with the devices previously mentioned, gave us what we considered a perfectly safe elevator and one that was very satisfactory so far as smoothness in running and operation were concerned. Being fully equal to anything on the market at that time, it gave us a first-class standing in the steam passenger elevator business.

It is unnecessary to give a cut of this machine, as it was so similar to the freight elevator.

Our first elevator of this type was installed in a building erected by the Singer Sewing Machine Co. for Field, Leiter & Co., at the northeast corner of State and Washington Streets, where the retail store of Marshall Field & Co. now stands.

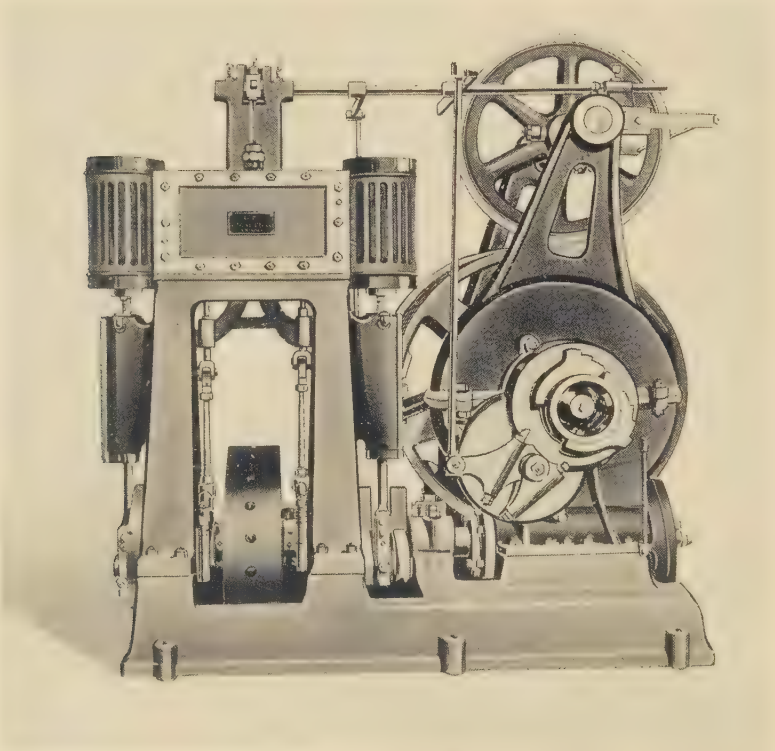
STEAM PASSENGER ELEVATOR
WORM GEAR

After putting in a number of the spur gear elevators just mentioned, we concluded that this style of gear was not altogether satisfactory, for

the reason that it did not produce sufficiently smooth motion; therefore, about the year 1874, we commenced building a Worm Gear Steam Passenger Elevator, which was a great improvement over the former style in this respect.

Our first machines of this type were belted from the engine shaft to the worm shaft, this being mainly for the purpose of getting up speed with the ordinary worm. Finding, however, that this was a clumsy arrangement, our people, at my suggestion, designed an elevator in which the engine was inverted and the worm was placed on the engine shaft, the worm having a triple instead of single thread, which enabled us to get up the required speed on the car without the use of a belt and made a very neat, compact arrangement.

Besides having practically all the patented improvements mentioned in connection with the spur-gear steam passenger elevator, this machine was



furnished with a patented loose worm on engine shaft, the object of which was to prevent the pressure on the worm interfering with the alignment of the engine.

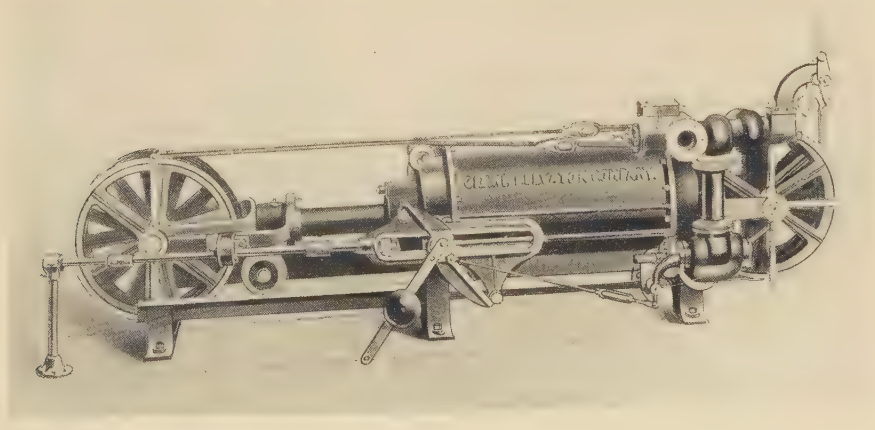
In the early days there were several firms in this country building worm gear steam passenger elevators, but their machines were all of a

bungling character, and it was not long before they abandoned this line. We, however, continued building this type of elevator until we retired from the elevator business and placed a great many of them in all parts of the country.

A few years before we went out of the elevator business we had so greatly improved this machine, by making the worm with finer threads, to insure still smoother motion of the car; balancing the change valve, so that it could be operated by a lever in the car; adding an improved automatic stop, and increasing the weight of the fly-wheel on the engine shaft, that it was adapted to the highest grade of elevator service, the car running smoothly and rapidly, handling perfectly, and the automatic stop being thoroughly reliable.

In 1895 we installed six of these elevators in the Spitzer Building, Toledo, Ohio, and in January, 1910, the owner, Mr. Spitzer, writes that they have given perfect satisfaction and are running just as finely to-day as when they were put in. He states that there have been no repairs to speak of and that he thinks they are the best machines on the market to-day.

Our last important contract for this type of elevator was in the store of Siegel, Cooper & Co., on State Street, between Congress and Van Buren Streets, Chicago. Here in the year 1896 we installed sixteen of these machines, and they not only have performed very severe service, but have proved perfect in running and handling, as well as exceedingly economical in operation.



HORIZONTAL HYDRAULIC ELEVATOR

IN THE year 1877 the question arose as to the utility of hydraulic elevators, which type of machine had been used in England for many years for handling freight in railway stations.

It will be readily seen that the hydraulic elevator possessed immense

advantages in many places for both freight and passenger service. Owing to the fact that it could be operated by the city water supply, it dispensed with the steam plant and the services of an engineer,—hence was much more economical for the smaller classes of jobs, especially where the pressure of the city water supply was considerable. Furthermore, it was simple and more satisfactory in running than any other machine on the market at that time.

Our first elevator of this type was installed during the year above mentioned in a building at the southwest corner of Madison and Market Streets, Chicago.

Although these elevators, as already mentioned, possessed considerable merit, it soon developed that they were very crude and subject to quite a variety of disarrangements and accidents, viz.:

1st In event of the hand-operating cable getting out of order when the platform was ascending, the piston was liable to run out of the cylinder and thus cause a serious accident.

To avoid this, I patented a device consisting of a spring buffer on the piston, in connection with an obstruction in the end of the cylinder, which prevented the piston running out of the cylinder; and then, as a further precaution, we devised an automatic shut-off valve, which was closed by the piston when it reached the end of its stroke. It will thus be seen that we provided two devices for the prevention of this class of accidents.

2d If the cars, when descending, were stopped by anything projecting over the hatchway, which was likely to occur in the case of a freight elevator, and the operator failed to instantly shut off the discharge of water, it would all run out of the cylinder and thus cause the lifting cables to slacken; then, upon removal of the obstruction, the car was likely to fall unless the slack in the cables had previously been taken up.

To prevent the water from running out of the cylinder under such conditions, I patented an arrangement by which the discharge was placed at the top of the cylinder instead of at the bottom. It soon developed, however, that although in discharging from the top the water would not run out, it could be syphoned out, and to prevent syphoning I put on a vacuum valve at the high point of the discharge, which completely answered the purpose.

3d Air was liable to accumulate in the cylinder and cause the car to jump and spring badly. This danger I overcame by devising an automatic air-escape, which was connected with the top of the cylinder and extended to a point above the tank that supplied the elevator.

While it was evident that our improved hydraulic elevator was exceedingly well adapted for passenger service, no opportunity thus far had been presented to introduce it for that line of work.

Shortly previous to this time, however, a competitor brought out a

vertical hydraulic elevator, and there immediately arose a rivalry between these two styles of machines, and as he had been successful in installing a number of these elevators for passenger service, which gave him something of a standing for his machine in that line of work, we were thereby placed at a disadvantage in getting started in the hydraulic passenger elevator business.

In 1879 Central Music Hall was being constructed in Chicago, and as it probably was the most important building in the city, the board of directors felt that, although but one elevator was required, its selection was a matter of the greatest importance, and they were exceedingly desirous that no mistake should be made. Therefore, a committee, consisting of three of the best engineers in this city, was appointed by them to look into this whole subject and it received a most thorough investigation.

This committee first decided that it would consider only the hydraulic type of elevator and went all over the country examining and testing elevators. In these tests our machines met all requirements and proved perfect in every respect, while the vertical elevator, which was our principal rival, turned out to be defective in a vital point and in one of the tests met with a serious accident.

The result of these investigations showed that our elevator was the best on the market and we were awarded the contract, and when our machine was installed it proved a great success. This had the effect of placing us in the front rank in the hydraulic passenger elevator business, as we already were in the steam elevator line, and the hydraulic became the popular elevator.

LEVER-HANDLING DEVICE

IMMEDIATELY after this a decidedly increased demand arose for hydraulic passenger elevators in office buildings, for which service a much higher speed than previously had been required was exceedingly desirable, but with this high speed the difficulty of controlling the machines with the hand-cable operating device became very serious.

To overcome this obstacle we introduced, in 1883, our lever-handling device, which was used in combination with an auxiliary valve and enabled the operator to run the car with ease at the high speed desired.

This invention, which was first employed by us on the machines that we placed in the City Hall, Chicago, met with approval everywhere, and its addition to our elevators made them absolutely perfect in handling at high speed, as they already were in general mechanism, and superior to all other machines on the market.

The first really fine job in which we employed this device was the Board of Trade building in Chicago. Although the speed called for was much greater than had ever previously been demanded of elevators, we greatly exceeded the contract requirements in this respect, the speed going up to 500 feet per minute and the machine being under perfect control.

As this rate of speed even now is looked upon as being practically the maximum at which a machine can be operated satisfactorily, it will be seen that this job was a decided advance over anything previously attempted in the line of elevator service for office buildings.

Unquestionably our elevator of this type was the best on the market at that time, and it has not been improved upon since then. We installed a large number of these machines in all parts of this country and in every instance they gave complete satisfaction.

Following is the record of some of the most important jobs in which these elevators were placed.

CHICAGO

Chicago Title & Trust Building, Washington Street.

Seven machines installed in 1891.

The engineer who has had charge of these elevators ever since they were put in states that they have given the best of satisfaction and that there has been no expense for repairs.

Young Men's Christian Association Building, La Salle Street.

Four machines installed in 1893.

Engineer reports that these have given good satisfaction and that the repairs have been but slight.

New York Life Building, La Salle Street.

Five machines installed in 1893.

The engineer says these have been very satisfactory and that the repairs on them have been nothing to speak of.

NEW YORK CITY

Continental Insurance Co.'s Building, Cedar Street.

Three elevators installed in 1894.

Upon visiting this building recently I was informed by the engineer (who has been there all of the time these elevators have been running) that the machines have given complete satisfaction, no trouble whatever having been experienced with them. There has been nothing in the way of repairs except bushing one or two sheaves.

Manhattan Bank Building, 40 Wall Street.

Here there are four of these machines, which were installed in 1884.

I also visited this building recently and was told by the engineer that the only repairs they have had to make during this period were occasioned by a trifling accident on one of the machines, largely due to careless handling, which caused the small lever to break. Three of these machines ran for 15 years without re-packing and one had not been re-packed since it was started, which is a most remarkable case.

However, the cylinders of these machines were lined with brass, and it is presumed that the packings would last longer than in machines not having brass-lined cylinders; at the same time it is remarkable how long these packings have lasted in many machines that were not brass-lined. The great secret of this undoubtedly lies in the fact that we took particular pains to see that these cylinders were bored *true* and smooth.

SAN FRANCISCO

A fine job was installed by us many years ago in the Mills Building, but of course this was destroyed by fire. The elevators gave good satisfaction.

BOSTON

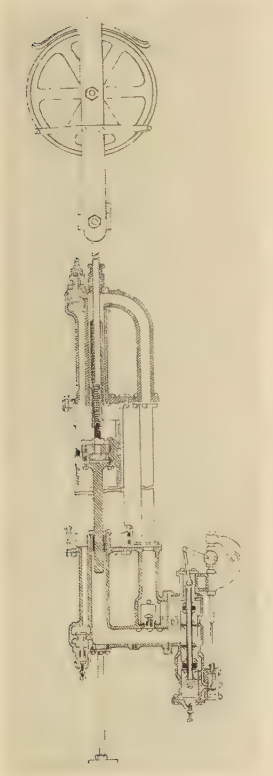
Ames building, 4 machines erected in 1890.

These have given excellent satisfaction; no repairs.

BERLIN, GERMANY

Here, in the year 1888, we installed four passenger elevators in a building erected by the Equitable Insurance Co. of New York. These have given good satisfaction; no repairs.

We placed immense numbers of these elevators in all parts of the country, and have no doubt that the substance of the above testimonials would apply to all of them, as we never have had a complaint about the workings of any of these machines.



VERTICAL HYDRAULIC ELEVATORS

Notwithstanding the fact that our horizontal hydraulic elevator was better than the vertical machine, it often happened that sufficient room for the machine could not be obtained in the basement, and for that reason we brought out, in 1890, our vertical hydraulic elevator.

The only device of much consequence required to make these machines perfect in operation was an automatic stop, and since we introduced this improvement it has been used extensively and has proved a perfect device for the purpose.

We put in quite a number of these machines and the following list shows some of the prominent buildings in which they were installed.

CHICAGO

Ashland Block, Clark and Randolph Streets.

Eight machines installed in 1892.

Engineer states that these have given good satis-

faction and that the cost of repairs has been very little.

Stock Exchange Building, La Salle Street.

Eleven machines installed in 1893.

Engineer reports that these have given the best of satisfaction, and adds that they have a cable which has run the full sixteen years.

NEW YORK CITY

Arnold Constable Building, Eighteenth Street and Fifth Avenue.

Four machines installed in 1894.

Upon recently visiting this building, I was told by the engineer that the elevators had given the greatest possible satisfaction, and that there had been no repairs whatever. He particularly mentioned that since their installation a number of Otis elevators were added to the job and that these machines have been nowhere near so satisfactory as ours.

This engineer reminded me of an important improvement made by us on this class of elevators at the time this job was installed, and that was the suppressing of the noise caused by the water passing through the valves, which in this, as well as in the Otis machine, was then a great annoyance.

HIGH PRESSURE HYDRAULIC ELEVATOR

WHEN buildings of a more extravagant and costly character began to be erected and space became exceedingly valuable, the standard hydraulic elevators were found to be undesirable for such work, as, owing to the size of cylinders and piping, they occupied a large amount of room. To overcome this objection we brought out, in 1890, a high pressure hydraulic elevator, which possessed a decided advantage in this respect; that is, we used 700 pounds pressure instead of in the neighborhood of 70 pounds as formerly, and of course all of the parts were reduced in that proportion.

Our first two machines of this type were for the Plankinton Hotel, in Milwaukee, after which we placed four in the Pabst office building, that city, and then came the following contracts in Chicago.

Schiller Theatre Building, Dearborn Street.

Four machines installed in 1892.

The engineer states that these have given good satisfaction and that the expense for repairs has been very light.

Boyce Building, Dearborn Street.

Three machines installed in 1892.

Marshall Field & Co.'s Building, Wabash Ave. and Washington St.

Six machines installed in 1893.

These have given good satisfaction; no repairs required.

Hartford Building, Madison and Dearborn Streets.

Four machines installed in 1893.

The engineer states these have been very satisfactory and the repairs very slight.

He adds that they also have two electric elevators, which cost fifty per cent more to maintain than the high pressure hydraulic, and that there is nothing equal to the latter for good service.

After putting in these machines we did not feel entirely confident that they were going to give good satisfaction, as we feared that with this very high pressure, the valves would cut and make trouble; but it now appears, after all these years, that they have turned out very satisfactory.

ANOTHER TYPE OF THE HIGH PRESSURE HYDRAULIC ELEVATOR

ABOUT that time Mr. Samuel Cupples, of St. Louis, who was putting in an extensive warehouse system in that city, came into the market for forty elevators. He had been using a large number of our steam freight machines, but it was evident that for a plant of this magnitude something very much better could be devised, and on our submitting to his engineer a somewhat different form of high pressure hydraulic elevator from that just described, he became convinced that it was superior to anything else he had found, and we were given the contract for these machines.

We introduced in these elevators an operating valve of new construction, in which we had very much more confidence than those used in the previous high pressure jobs, and when installed these machines and valves proved to be a great success in every way, being vastly superior to anything previously brought out in the freight elevator line.

EFFICIENCY

NOTWITHSTANDING we had guaranteed an exceedingly high efficiency, when a test was made after completion of the work and the elevators had been in operation for some time, it was found that we almost doubled this guarantee, in which respect this probably was the most remarkable piece of elevator work ever produced. In fact the whole job was the most complete and satisfactory one ever put in and to-day stands unexcelled.

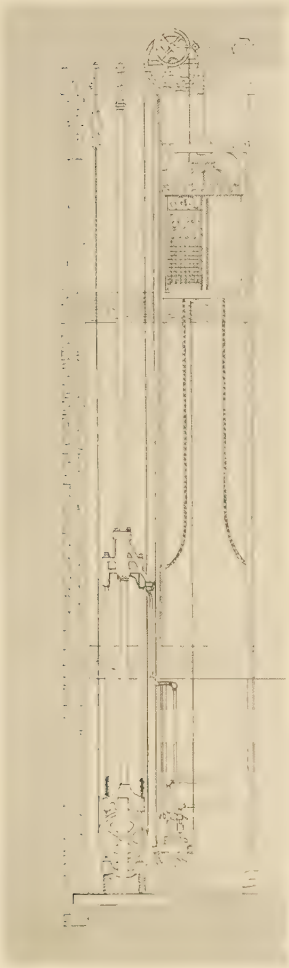
These elevators required but one-fourteenth as much fuel as the steam elevators which prior to that time had been universally used for a similar class of work, and the care which, with those machines had been a very important matter, with this new type was merely nominal.

Another innovation introduced by us in this plan, which was absolutely necessary to the successful working of the apparatus, was the employing of glycerine instead of water for operating the elevators. By this means we avoided all danger of the machines freezing up, which in a plant of that character, where the elevators were so scattered and exposed, surely would have resulted had water been used for this purpose.

THE CUPPLES TYPE OF ELEVATOR FOR PASSENGER SERVICE

THE machines just described, which we installed at the Cupples warehouse, proved so satisfactory that we felt confident this type, when slightly modified, would be adapted for passenger service, at least in stores, and in 1895 we placed fourteen in Mandel Brothers' store at the northeast corner of State and Madison Streets, Chicago.

The only changes we found it necessary to make in this machine in order to adapt it for such work were,—first, arranging the operating valve with lever handling device in connection with an auxiliary valve; second, operating the auxiliary valve by the house pressure instead of the high pressure used in the elevator. We anticipated that if the high pressure water were used for the auxiliary valve it would make the operating of the machine too sensitive; also, that it would be very severe on the valve, causing a tendency to cut the metal.



Mandel Brothers' engineer (who has had charge of these elevators ever since they were installed) states they have given the most perfect satisfaction and that no repairs have been necessary; in fact, he claims that they have no equal; and their manager, Mr. Kelly, has volunteered a letter in which he expresses his great admiration for these machines, adding that "even now we consider them the best elevators on the market."

As conclusive evidence of the confidence which Mandel Brothers have in the merits of these elevators, they afterwards added fifteen more of this type, and now contemplate placing seventeen additional machines in the new building soon to be erected by them.

In addition to its simplicity and perfect mechanical arrangement, this type of elevator is exceedingly economical in operation, as was shown in both the Cupples and the Mandel Brothers jobs. I am informed by the engineer at Mandel's that the cost of operating their machines including every item of expense, is five cents a mile per elevator, which figures out five round trips for a penny, while the electric elevators at Marshall Field & Co.'s store, where the electric current is purchased on a large scale, cost nine cents a mile to run.

At the time we installed these elevators I considered them very superior for that kind of service, and in view of the satisfactory experience with

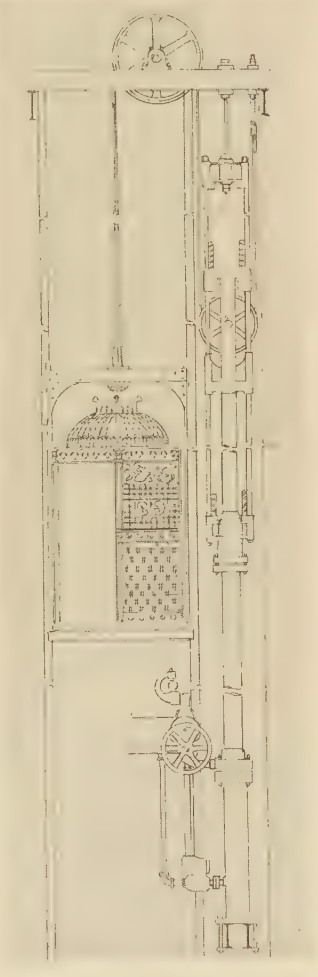
them, covering a period of fifteen years, I do not hesitate to say now that they are the best elevators ever placed in any store.

Whether this type of machine would be suitable in cases where very high speed was required had not been determined at the time we retired from the elevator business, and I believe it has not been decided since then, as our successors have paid no attention to this subject, but in all probability it could be adapted for such service.

PULLING PLUNGER ELEVATOR

IN the year 1894 I conceived the idea of a plunger elevator, which was a radical change in elevator construction, being the reverse of all other machines.

Instead of using the power to lift the load, we used the power to raise a weight contained in the plunger and working gear, which weight was somewhat in excess of the maximum load to be carried, and, on allowing the water under the plunger to escape, the latter descended, thus lifting the load.



This elevator was exceedingly simple in construction, one of its merits in this respect being that the piston and its gearing, in addition to lifting the load, counterweighted the car, thereby dispensing with all the usual counterweighting mechanism. It also possessed great advantage over the high pressure elevator previously mentioned, in that it required still less space than was needed for that type of machine; in fact it occupied no available space.

So far as rapidity and smoothness of running and economy of operation were concerned, it surpassed all other styles of elevators, its efficiency being as high as ninety-three per cent.

Our first contract for this pulling plunger elevator was with the American Tract Society, of New York City, it being for six elevators for their office building on Nassau Street near Park Row. The contract provided that we were first to erect one machine in order to demonstrate its utility, this machine to be tested by a committee of experts composed of some of the most prominent engineers in that city, after which, if it proved satisfactory, we were to proceed with the installation of the remaining five.

The result of this test being highly satisfactory, we then went ahead and completed the contract.

The construction of this machine required that there be a back pressure on the discharge equal to a column of water half the height of the building, and our engineer made the mistake of using a compression tank in the basement for that purpose. This made it necessary to maintain an air cushion equivalent to that pressure, and when one of the machines was being used for night service and no engineer was on duty, the air was allowed to escape from the tank, thereby causing a very serious accident.

The proper method of erecting this job was to place an open tank half way up in the building, this answering the same purpose as the compression tank and rendering it unnecessary to maintain the air pressure. I at once had this change made there, and now learn from the engineer of the building that the machines have been running ever since then with the greatest satisfaction.

This type of elevator proved to be all that possibly could be desired, and I do not hesitate to say to-day that it is the best one ever produced for high speed and high grade service.

In addition to the American Tract Society job, we placed these elevators in the following buildings and I am informed that in every instance they gave the best of satisfaction.

CHICAGO:
- Roanoke Building ..... 3 elevators
- Great Northern Office Building ..... 5 elevators

ST. LOUIS:
- Bank of Commerce ..... 2 elevators
- Lincoln Trust Building ..... 6 elevators

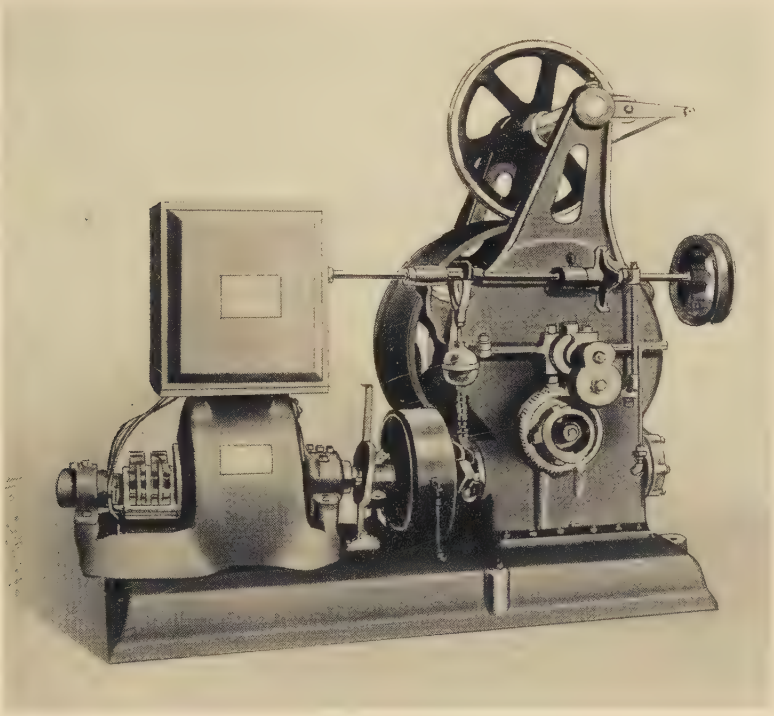
INDIANAPOLIS:
- Stevenson Building ..... 4 elevators
- Majestic Building ..... 3 elevators

DETROIT:
- Wayne County Court House ..... 5 elevators

DES MOINES:
- Observatory Building ..... 2 elevators

DULUTH:
- Lonsdale Building ..... 2 elevators

SAN FRANCISCO:
- Call Building ..... 3 elevators



ELECTRIC ELEVATOR

WE TOOK up this line about the year 1894, and brought our electric elevator as nearly to a state of perfection as any in this country. I understand that no better machines of this type have been produced since then than those turned out by us.

Quite a number of these elevators were put in by us and in every instance they gave entire satisfaction. Our business in this line, however, never was very large, as the electric elevator was developed only a short time before we went out of the elevator business.

Samples of those we installed are to be found running to-day in the following buildings in this city:

Silversmith Building
Chicago Club.

SHEAVE STEAM ELEVATOR

About the year 1890 we built, at my suggestion, a steam passenger elevator in which the drum was dispensed with, a sheave being used in its place.

Our object in bringing out this machine was to get one that would be adapted to extremely tall buildings, as there was no machine then constructed that seemed to be entirely satisfactory for such service.

The drum machine was undesirable for the reason that an exceedingly large and cumbersome drum was required to take care of the large amount of cable needed; and it occurred to us that, everything considered, the steam elevator would be better adapted for this work if a sheave were substituted for the drum. By this means we entirely overcame the trouble referred to, the sheave being only wide enough to allow the cable to go around it once, which produced sufficient friction to operate the car, the cable being connected on one side of the shaft with the car and on the opposite side with the counterweight.

We installed a machine of this type in the Mallers Building, Chicago, and another was placed in a building in Minneapolis.

While we were quite pleased with the operation of our sheave elevator, it transpired that this type of machine was defective in one respect,—that is, there was no way by which it could be equipped with a reliable automatic stop, as the cables would slip somewhat on the sheave, thus throwing the ordinary automatic device out of harmony. We looked upon this as being rather a serious fault, and finding no way to overcome it, we did nothing further in the way of building these machines, although, as before stated, the two which we did install gave perfect satisfaction without the automatic stop.

Our successors in the elevator business have since taken up this machine and applied an electric motor to it in place of the steam engine, and with this change it has become the only satisfactory elevator for very tall buildings.

This is the type of machine that has been placed in the towers of the Singer Building and the Equitable Life Insurance Co.'s building in New York City.

MISCELLANEOUS ITEMS.

RETARDER ON THE CAR-OPERATING LEVER

THE object of this invention is to retard elevators when running too fast from the weight of the load (these cars more particularly become a source of danger where dining rooms and public halls are on the upper floors of tall buildings). In cases of this kind the weight of the passengers is so great that the car is apt to get under dangerous headway, and the way operators ordinarily manage such elevators is to keep checking up the escape of the water from the cylinder through the valve by means of the operating cable.

But this is a somewhat dangerous arrangement, as the operator's neglect to pay close attention to it might result in the car attaining so high a speed as to throw in the safety device, and in that way hold the car up in the shaft, thereby causing annoyance and delay in again getting the car started; or it might strike the lower landing very hard and thus cause damage.

A device for preventing this consisted of a spring so arranged on the operating lever that it was necessary for the operator to exert a slight pressure in order to open the valve wide. By not being open wide the dangerous speed could not be obtained, so that neglect to pay attention to the matter could not result in excessive speed. In other words, the operator could not obtain the excessive speed without exerting this pressure, in that way opening the valve wide.

I regard this as a nice little device, but instances requiring its use did not often arise.

DOUBLE DOORS

To facilitate the loading and unloading of passenger elevator cars, I invented an arrangement by which two doors were used instead of one, both being operated simultaneously by an arrangement of levers.

These doors, instead of being half the width of the opening, were so made that each door was one-third the size of the opening, which increased the width of the opening of the car to two-thirds the front area, instead of one-half as in the case of the old arrangement of single door.

NEW OFF-SET GUIDE POST SUPPORTS

The use of this style of guide post supports made a saving of several square feet of space throughout the entire height of the building, which was of considerable value in very tall buildings.

SUMMARY

From the foregoing it will be seen that we brought out and introduced eleven different types of elevators, viz.:

1. Factory Elevator.
2. Standard Steam Freight Elevator.
3. Spur Gear Steam Passenger Elevator.
4. Worm Gear Steam Passenger Elevator.
5. Horizontal Hydraulic Elevator.
6. Vertical Hydraulic Elevator.
7-8. High Pressure Hydraulic Elevator (two styles).
9. Pulling Plunger Elevator.
10. Electric Elevator.
11. Sheave Elevator.

All of these with the exception of the Factory elevator and the first style of High Pressure Hydraulic, possessed most decided merit.

NO IMPROVEMENTS BY OTHERS

UNQUESTIONABLY we produced a greater variety of elevators and did ten times more to develop this line of machinery than all other manufacturers combined. No important improvements have been made since we went out of the elevator business, and all our machines stand unsurpassed at the present day.

One of the most gratifying as well as remarkable features in connection with our long and extensive experience in this work, covering every style of elevator and all kinds of service, is the fact that no accident ever occurred due to the fault of our machines, with two exceptions; one of these was the accident in the American Tract Society Building already explained; the other was caused by a pipe bursting on a hydraulic elevator when the car happened to be so near the lower landing that it struck the floor before the operating device could catch it.

It is but justice to ourselves to say that in the case of the Tract Society elevator, it did not get beyond the experimental stage, and the accident simply was caused by a blunder of the engineer in not seeing that it would be better to put the discharge tank half way up the building, instead of using the compression tank.

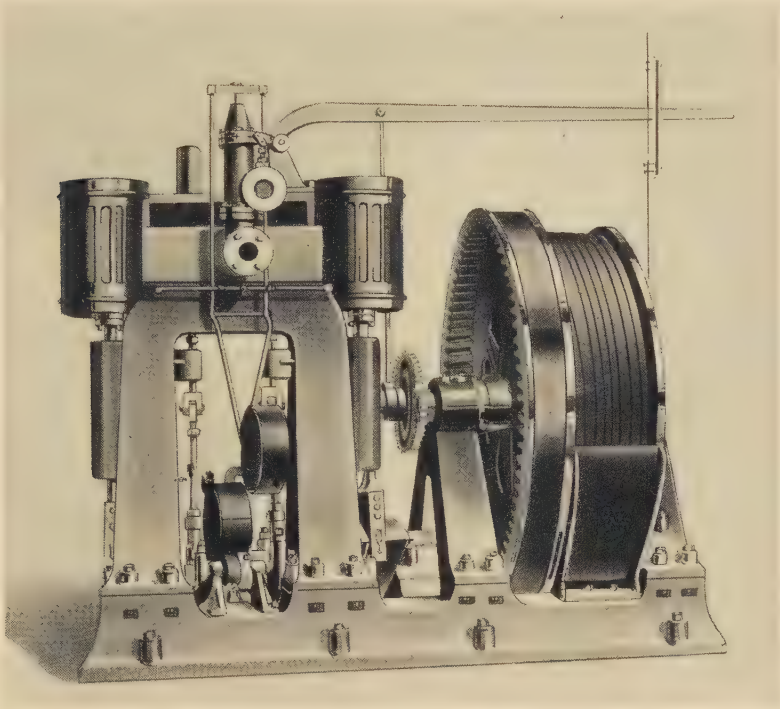
With regard to the case of the pipe bursting; such accidents occasionally occur with goods that have been tested, as that was claimed to have been tested, up to the proper factor of safety; sometimes they will, in an unaccountable way, burst under ordinary working pressure. And the peculiar conditions under which this accident occurred have not been overcome today—that is, all of the safety devices we have for preventing such accidents require some space for cars to run in order to get up speed and throw in the safety device; in other words, the safety devices are thrown in from excessive speed.

In this case, the pipe gave way when the car was so near the lower landing that the speed could not be obtained before it struck the landing.

As a matter of fact, therefore, I think we are entitled to go on record as practically never having an accident, and this not only applies during the time we were building elevators, but ever since then.

BLAST FURNACE MACHINES

IN 1870 a blast furnace engineer from Sharpsville, Pa., who was building a furnace at Terre Haute, Ind., visited our factory at 10 North Jefferson Street, and, on seeing one of our steam freight elevators in use, he took a great fancy to it, stating it was just what he wanted as a hoist for his furnace, and gave us an order for one. Soon afterward, through his recommendation, we received several orders from Sharpsville, due no doubt to this engineer's experience with the one we put in for him at Terre Haute.



Previous to that time we had no knowledge of the requirements or importance of a hoist for a blast furnace. It appears that the matter had not received the attention its importance demanded, or that good engineering ability would have devised, and from the fact that these two or three "make shift" hoists, as we considered them, were much better than anything heretofore applied to a blast furnace, it occurred to me that this matter was of sufficient importance to warrant more attention being given to it.

Believing that a machine could be built which would be better adapted for that business than our regular freight elevator, I had our draughtsman lay out a machine with engines inverted, and gearing directly to the drum, instead of belting in connection with an intermediate shaft with gearing to the drum, which proved to be an immense success and resulted in a very large business.

From that time until we went out of the elevator business, we built probably 95 per cent of all the hoists placed in blast furnaces in this country, and today our successors have a monopoly of this business.

From the first our machine proved an immense success and it never has been improved upon, except in the way of strengthening certain features, so as to better adapt it for the heavier work now demanded. With these slight modifications, it is the standard blast furnace hoisting engine at the present time.

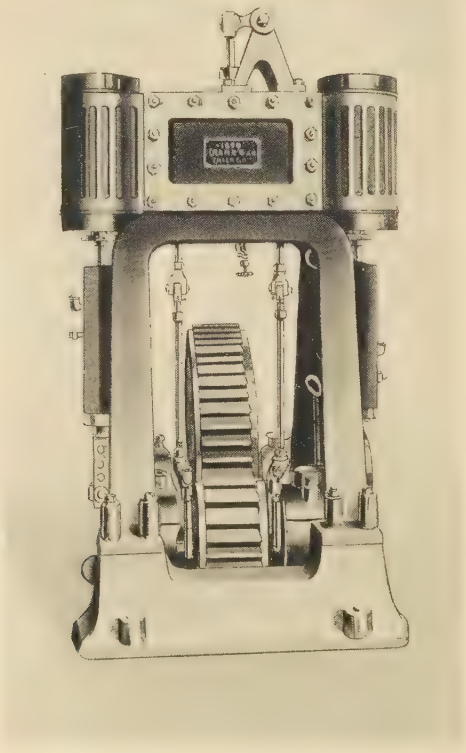
Before we retired from the elevator business we wrote to a large number of people who were using these machines, to ascertain what satisfaction they had given, and the statements we received were most remarkable, showing that in many cases the machines had run continuously for as much as twenty years with little or no repairs.

This was fifteen years ago and I understand that this record still continues. A customer at Sharpsville, Pa., states that he has one of these engines which has been in continuous use for thirty-five years. It should be remembered that in that line of work continuous service means practically every hour for this whole period.

I will not attempt to give a list of the firms using our hoists and reversing engines, as to do so would necessitate the naming of practically every iron company in the country.

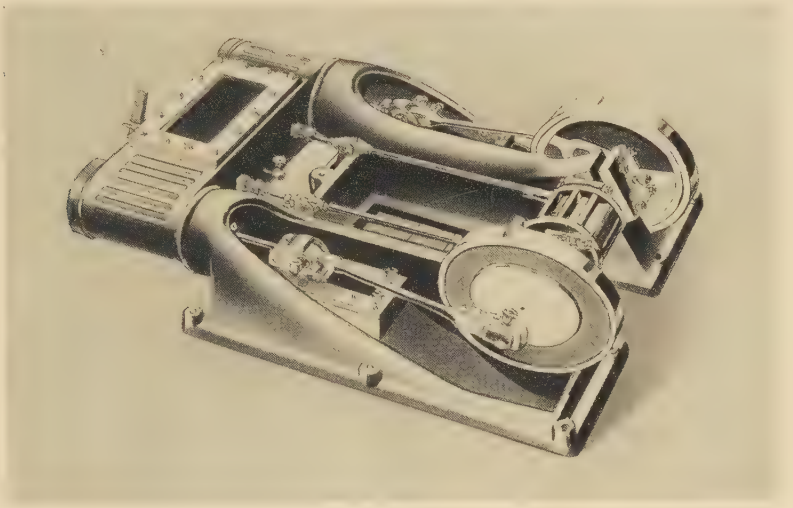
In addition to the large business that we enjoyed in the United States in this line, we exported some of these machines to Germany, and since then our successors have exported them to nearly all parts of the world from Nova Scotia to Bombay.

I think it quite remarkable that we should happen to stumble on to so important a matter as this, and that the first machine we produced was absolutely perfect.



REVERSING ENGINES

ABOUT the year 1880, by reason of the improvements that were being applied to rolling mills, a demand arose for small reversing engines, and incidentally we were applied to for some of these. It at



once appeared that our machines possessed great merit for this work and a large demand for them arose, so that in a very short time we were doing a heavy business in this line.

It was reported to us in 1895 that the Carnegie people alone had a hundred of our engines in use.

These machines were made of various sizes and shapes, and on all of them we used the same reversing valve that we had employed on our steam elevators.

It seems we were fortunate in building these engines very strong and simple, for which reason they withstood the rough usage of the rolling mills better than anything else in the market, the result being that we enjoyed practically a monopoly of this work. This is another instance of our stumbling on to producing an article of unusual merit. I understand that these engines are to-day the best in the market for that purpose.

MY INVENTIONS

WHILE I do not consider myself a great inventor, and never have invented anything of a particularly complicated character, I do believe that I am reasonably quick to notice defects in machinery or in articles in our lines, and frequently find the remedy for them, or when unable to see the remedy myself, I am alert to bring the matter before some of our experts.

One notable fact in connection with my work in this direction, which can not be said of many inventors, is that all my inventions have been of practical utility.

Following is a complete list of my inventions, together with descriptions of many of them; illustrations and descriptions of the others will be found in the chapters on steam-warming, elevators, machinery, etc.

PUTTING ONE-HALF OF A PATTERN ON EACH SIDE OF A PLATE

THIS, my first invention, was made at the very outset of my business career, it being brought out in connection with the casting of lightning-rod points and nuts, which, as mentioned in the early portion of this history, was the first work I did when starting my brass foundry.

This invention proved to be an exceedingly important one, and today is used extensively in a modified form, consisting of the pattern being on one side of the board only and completely matched, so that the two molds will come together perfectly. This, with the automatic rapping device, which enables the molds to be lifted from the pattern, is the perfection of molding devices for producing an enormous line of small goods, such as fittings, etc.

DOUBLE SLIDING CHUCK FOR THREE-WAY TAPPING MACHINE.

DOUBLE COCK LUBRICATOR FOR OILING STEAM CYLINDERS.

IN THIS invention I dispensed with an air-escape cock, a passage in the upper cock being made use of to accomplish the purpose desired.

The air-escape was rather an ingenious piece of mechanism, as it combined two cocks in one, thus answering a double purpose.

This lubricator was extensively used at that early period, but long ago was abandoned for automatic devices.

OIL PUMP FOR OILING CYLINDERS TO BE DRIVEN BY POWER FROM ENGINE

THIS consisted of a pump so proportioned and graduated that it would pump the necessary amount of oil into the cylinder, and when once set was set for all time and required no care or adjustment.

It undoubtedly possessed merit, but, like many other devices in the way of specialties that came out from time to time, it was neglected on account of the pressure of more important things, and only recently has been taken up by other manufacturers.

AUTOMATIC DEVICE FOR REGULATING STEAM PUMP TO SUPPLY WATER FOR BOILER

THIS was a device in which a ball on the end of a lever, placed in the steam chamber connected with the boiler, operated a balanced valve in the steam pipe that connected the boiler with the pump, thereby controlling the water in the boiler.

It really was a nice invention, but in the hurry and rush of business we did nothing more than to put it into practical operation.

LOW-WATER ALARM FOR STEAM BOILERS

AS SHOWN in our early catalogues, this device was composed of three parallel pipes joined by a casting at top and bottom, the center pipe being simply a tie to prevent the outside pipes from expanding lengthwise. The lower casting was connected with a piece of pipe that extended down below the water line of the boiler, and when the water in the boiler was at the proper height the outside pipes above mentioned were filled with water and were comparatively cool. But when the water in the boiler fell below the end of the extension pipe, the two outside pipes became filled with steam instead of water and as the tie prevented these pipes from expanding lengthwise, the heat from the steam caused them to expand outwardly, which motion operated a valve in one of the pipes, thereby admitting steam to a whistle and giving the alarm.

This was a very meritorious article,—in fact, no better low-water alarm ever was placed on the market and the demand for it was quite large.

SWIVEL SLIDE REST FOR TURNING BALLS. TRIPLE BORING BAR MACHINE

THIS machine was built for boring at one time both cylinders, the cross-head guides and the bearings for crank shafts for steam elevator engines, and was exceedingly meritorious, not only doing the work much more rapidly than any other machine, but, on account of being built true, the work came out absolutely true.

This invention also was notable for the reason that, so far as I know, it was the first step in the specializing of machinists' tools, which is very largely the practice to-day.

SEWER-GAS DETECTOR

IN THE early days the plumbing and drainage work in houses was done in a very slip-shod manner, by reason of which trouble from sewer-gas was quite common, and the leaks were exceedingly difficult to locate, the result being that often a great deal of damage was done by tearing up the floors in a house unnecessarily in a "wild goose chase" to find the leak.

To simplify this work I invented a device by which a pungent liquid is introduced into the drainage system. As the odor of this liquid can escape only through a defect in the drainage system, this enables a close observer to locate any defects with certainty, thereby avoiding the unnecessary tearing up of the building.

This device was placed in the hands of a very discreet man, and with it he did a large amount of excellent work around Chicago. It really was surprising to see how quickly he could locate the trouble.

PATTERNS FOR BRANCH TEE COIL HOOK PLATES

IN THIS arrangement the hooks, which were made on a true radius, were hinged on the plate of the pattern and drawn on a curve out of the sand, thereby making a very nice casting and permitting the work to be done more quickly than in the former practice. It was a very pretty little invention and is extensively used for this work in our foundry to-day.

BACK ARCH FOR BOILERS

IN OUR early experience with steam-warming apparatus it often was necessary to take down the back arch of tubular boilers in order to gain access to the ends of the tubes to be repaired, and in such cases the services of a mason were required to rebuild the arch.

To overcome this I devised a cast-iron frame in which to build this arch, so that when necessary to take it down it could readily be thrown back in one piece and was easily replaced without the aid of a mason.

UNDER-CUT MACHINE USED IN FINISHING BRASS GOODS.

PIPE LAP JOINT

THIS is a joint where a flange is made on the end of the pipe by turning the end of the pipe over on a loose cast flange, and the invention consists of retaining all the strength in the flange of the pipe that it is

possible to retain in finishing it up. In other words, the thick part of the flange close to the body of the pipe is retained by making a corresponding bevel in the cast flange, in this way producing a much stronger and better job than previously was obtained. So apparent was this improvement that it has become extensively used.

MACHINE FOR SCREWING UP PIPE COILS

THIS consisted of a revolving chuck that gripped one bend, while the bend on the opposite end of the pipe was held in a stationary chuck. As soon as the bend was screwed up to the proper tension, the chuck gave way and the machine stopped, this operation being repeated until a section of the coil was made up. The coil was placed on a revolving table in order that the next bend to be screwed up could be quickly placed in the revolving chuck. By this means the different sections of the coil were put together with great rapidity. At the time this machine was brought out these coils were extensively used and we had a special department for this work.

THE CASTING OF BABBITT METAL BOXES IN CONNECTING RODS TO TAKE THE PLACE OF BRASS BOXES

THIS was an arrangement of a mold that corresponded with the requirements of the brass which usually was fitted in connecting-rods, the mold being put in place on the connecting-rod and the babbitt-metal poured into it. The result was that we had a babbitt-metal instead of a brass box, and all fitting, boring and finishing was practically saved.

At first we felt some uncertainty as to whether this would give satisfaction, but time has demonstrated that it is really a very meritorious operation.

This invention was employed by us exclusively on our steam elevator engines for a long time, and many of these engines have been in use for more than thirty-five years, without any repairs being needed on this, or, in fact, any other part of the elevator, as is particularly shown in the chapter on elevators.

TWO-SPINDLE RETURN-BEND TAPPING MACHINE

THIS machine consists of an arrangement of two parallel spindles, one being stationary and the other having a toggle-joint mechanism that permits it to be set on any angle that may be required in the bend. Also, it has a double sliding chuck that allows a fitting to be changed in one chuck while another is being tapped in the other chuck.

This has been a very successful machine and is to-day the best one for this purpose. We have used it in our factory for over forty years.

TAPPING MACHINE HAVING THE SPINDLES ARRANGED IN A CIRCLE AROUND A CENTRAL GEAR WITH A TURNTABLE

THE particular merits of this machine were the minimizing and the simplicity of the gearing.

GRADUATED OPENING IN GLOBE VALVES TO PREVENT WIRE-CUTTING ACROSS THE SEAT

This invention consisted of a device by which, when a valve is required to be opened only a trifle, a contracted opening is made below the valve seat, instead of allowing the steam to cut across the face, as occurs when constructed in the usual way. A slightly tapered plug is attached to and made a part of the valve disc, this plug passing through the valve seat partition and filling the valve partition at the upper edge of the conical valve seat.

In order that the tapered plug may give the required area through the valve, the disc has to be lifted quite a distance from the seat, and thus the wire-drawing comes between the partition of the valve and this plug instead of crossing the valve seat.

While this undoubtedly is an excellent piece of mechanism, like many other good things, the point is too fine to be seen and appreciated by the ordinary mechanic, and the only way it could be made valuable in our business would be to have it taken up by some one who had the perseverance and energy to bring it intelligently before the consumer. Of course such valves only apply to certain classes of work where the graduation is very large, such as steam pumps used for feeding boilers.

CEILING PLATES FOR VERTICAL PIPES

This invention consisted in making the ceiling plates in halves, with a dove-tail device which allows the two parts to be slipped together in place after the pipe has been put up. This exceedingly neat and meritorious article has been extensively used and copied by other manufacturers and is the standard ceiling plate to-day.

PIPE HANGER

My pipe hanger was constructed on lines similar to the ceiling plate above described, inasmuch as it could be put on after the pipe was in place, and made a very neat job. It also has been very extensively used and to-day is the best thing on the market for the purpose.

STEAM WHISTLES

AT A very early date I devised an improvement in steam whistles to avoid fitting the stem part to the body, this consisting of casting

the stem and body parts in one piece and making a slot for the steam by running through the partition a tool of the right width to allow the steam to escape. The scheme was a very neat one and saved considerable labor in fitting up the whistle.

DESIGN FOR HAND-WHEEL FOR STEAM VALVES

This invention consisted of a cast hand-wheel for valves, so constructed as to overcome the excessive heat, which in many cases was very objectionable.

The wheel was given a large amount of outer area by making the rim slotted and hollow, which lowered the temperature of the heat as it passed through the hub, so that it would not be uncomfortable to the hand.

This wheel was introduced as a substitute for the wood handle device, and being absolutely substantial and reliable, it answered the purpose very much better than that article and has been extensively used.

DEVICE FOR DETECTING DEFECTS IN RAILWAY ROADBEDS

This invention consisted of a pen working on a paper tape, which recorded the jarring of the cars and thus made it easy to locate the defective places in the track.

A test of this clever and ingenious device showed that it worked well, and feeling that this was a very important matter, I called the attention of several railroad men to it. But as they seemed to take little interest in the subject, and the railroad business was something in which I was not interested, I did not care to urge this invention upon them, although I am thoroughly satisfied that it could be used by them to very great advantage.

MY INVENTIONS IN STEAM-WARMING AND VENTILATION

WATER LEG STEAM TRAP

This device consisted of a "U" shaped pipe similar to a water-trap in a wash basin, and allowed only the water to escape. It was adapted to very low pressures only, such as exhaust steam.

FEEDING COILS AT THE BOTTOM.

WALL COILS DIVIDED INTO SECTIONS AND RADIATORS HAVING PARTITION IN THE BASE FOR THE PURPOSE OF REGULATING THE HEAT.

COMBINED HOT AND COLD AIR REGISTERS.

DOUBLE LEVEL HOT-WATER HEATING DEVICE.

I was led to get up this device through the request of a gentleman who had a hot-water heating apparatus which was so arranged that the expansion tank was just above the boiler, and who desired to warm by direct

heat a conservatory that was located on a higher level, which was impracticable under that arrangement. To accomplish this I devised a system of pipes so arranged that the heat from the pipes on the lower level warmed the water in another set of pipes that connected with a coil in the conservatory on the upper level.

SYSTEM OF HEATING IN THE OLD
FIRST NATIONAL BANK BUILDING, CHICAGO.

HEATING APPARATUS IN
TRINITY EPISCOPAL CHURCH, CHICAGO.

HEATING AND VENTILATING SYSTEM IN
CENTRAL MUSIC HALL, CHICAGO.

MY INVENTIONS IN THE ELEVATOR LINE

ARRANGEMENT OF VALVE ON ENGINE OF FACTORY ELEVATOR
BY WHICH ENGINE WAS PREVENTED FROM RUNNING AWAY.

APRON STOP ON STEAM FREIGHT ELEVATOR.

IN THE operation of steam freight elevators it sometimes happens that a box or other obstruction will project over the hatchway and strike the descending elevator platform, thus stopping it, and as the engine continues running the cable will unwind and get into the gearing, in that way becoming badly snarled and damaged.

To prevent this I invented an apron which is placed under the drum, and when the cable slackens its weight bears on this apron, which is so arranged that it will then cut off the steam, thereby stopping the engine.

BELT BRAKE ON STEAM FREIGHT ELEVATOR

The object of this device was to stop the engine in event of the belt breaking, and thus prevent it from running away and causing an accident. It was a very simple matter, as these elevators were provided with what is called an "idler" on the belt for the purpose of causing the belt to adhere to the pulley, and the mechanism was so arranged that the idler in coming down when the belt broke would shut off the steam, thus stopping the engine.

LOOSE WORM ON ENGINE SHAFT OF WORM
GEAR, STEAM PASSENGER ELEVATOR

The object of having the worm loose on the shaft was to prevent the pressure on the worm from interfering with the alignment of the engine.

SHEAVE STEAM ELEVATOR

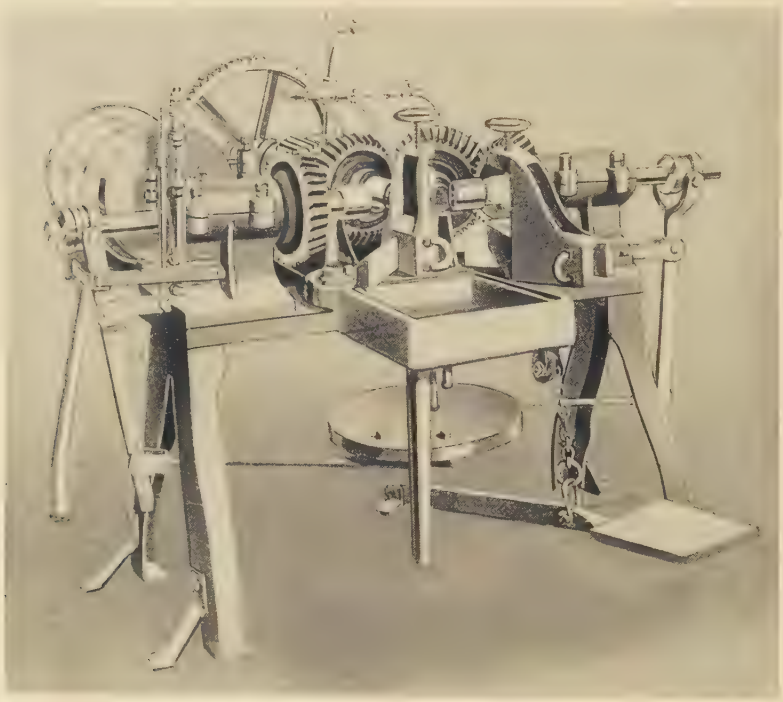
This machine was especially designed for very high buildings, and is fully explained on pages 135 and 136.

MACHINERY

OUR SPECIAL MACHINERY AND TOOLS

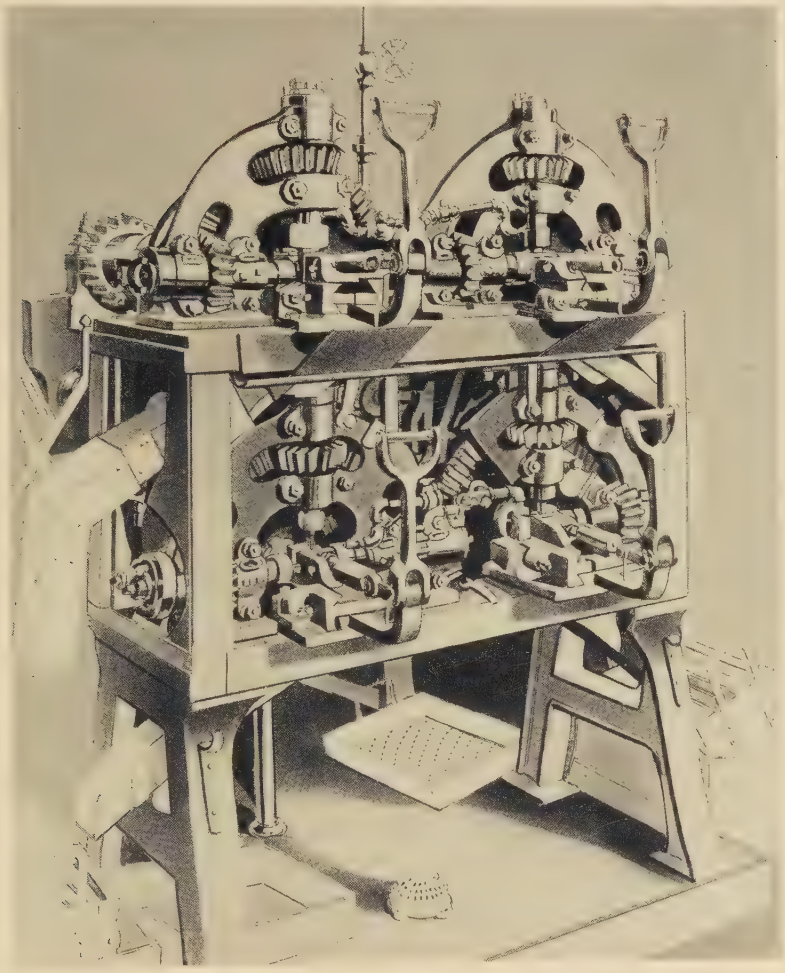
ONE of the chief contributors to our success has been our special machinery, invented, designed and built by ourselves, together with an immense variety of small tools.

On the following pages will be found illustrations and brief descriptions of the most complicated of these machines.



THREE-WAY TAPPING MACHINE WITH SLIDING CHUCK

Explanation of this machine will be found on page 48.

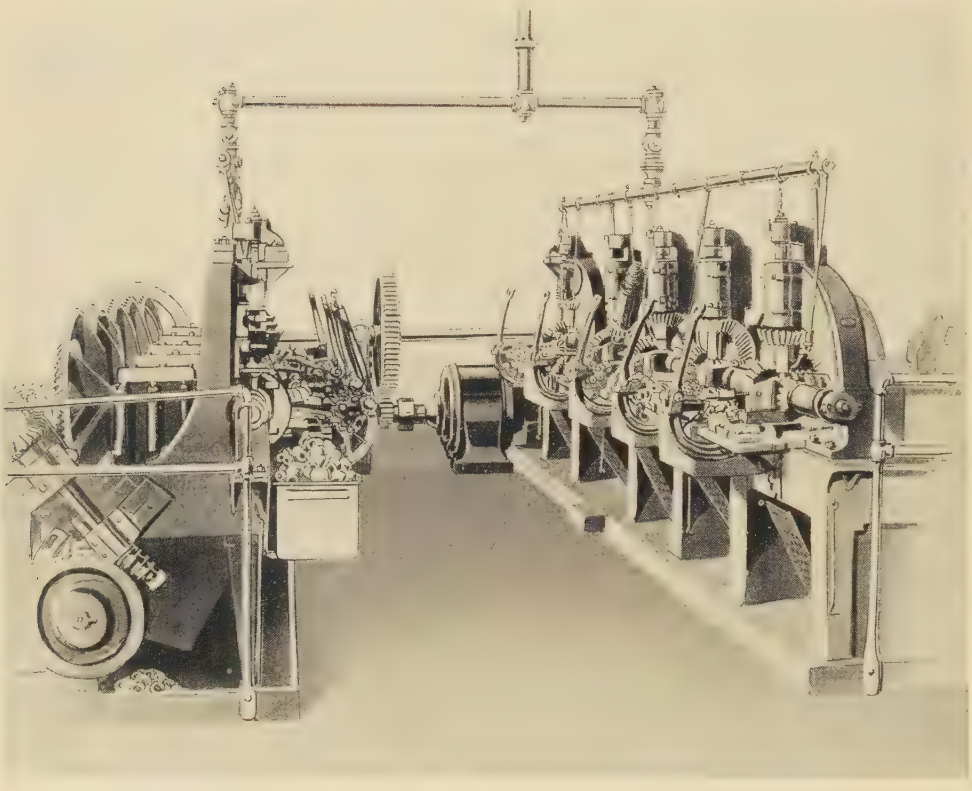


ORIGINAL FOUR-CHUCK AUTOMATIC TAPPING MACHINE

The first attempt to produce a machine of this character was made by a Mr. Pope of Cleveland many years ago. It caused quite a sensation, and several Eastern manufacturers of fittings requested me to join them in buying the patent, but this I was not disposed to do.

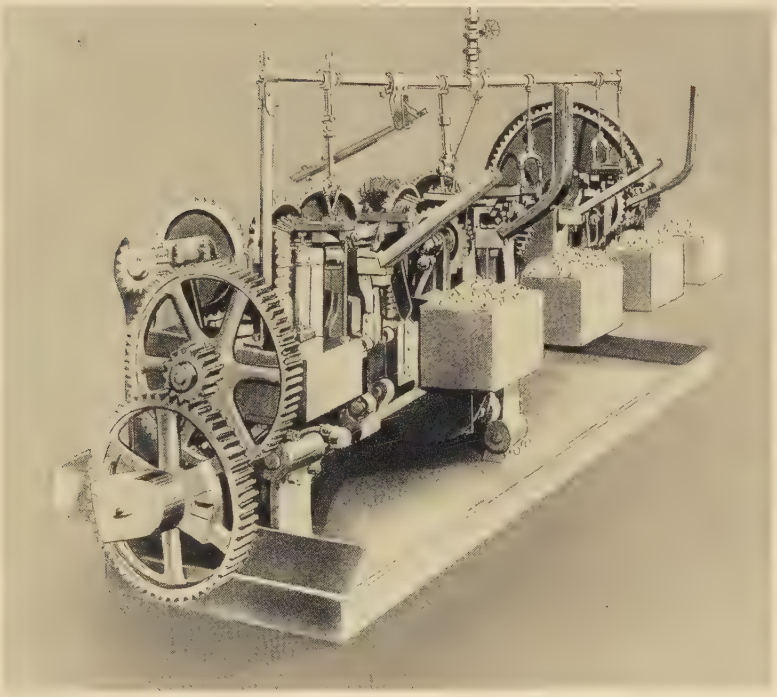
I soon came to the conclusion that a better machine could be produced, and after talking the matter over with Mr. David Ackerman, foreman of this department of our business, and giving him my ideas, he worked out our present tapping machine.

This turned out to be a very great success, and, so far as I know, it never has been improved upon. I understand that to-day these tapping machines are in general use by manufacturers of fittings, and that an outside firm is making a business of building them for the trade.



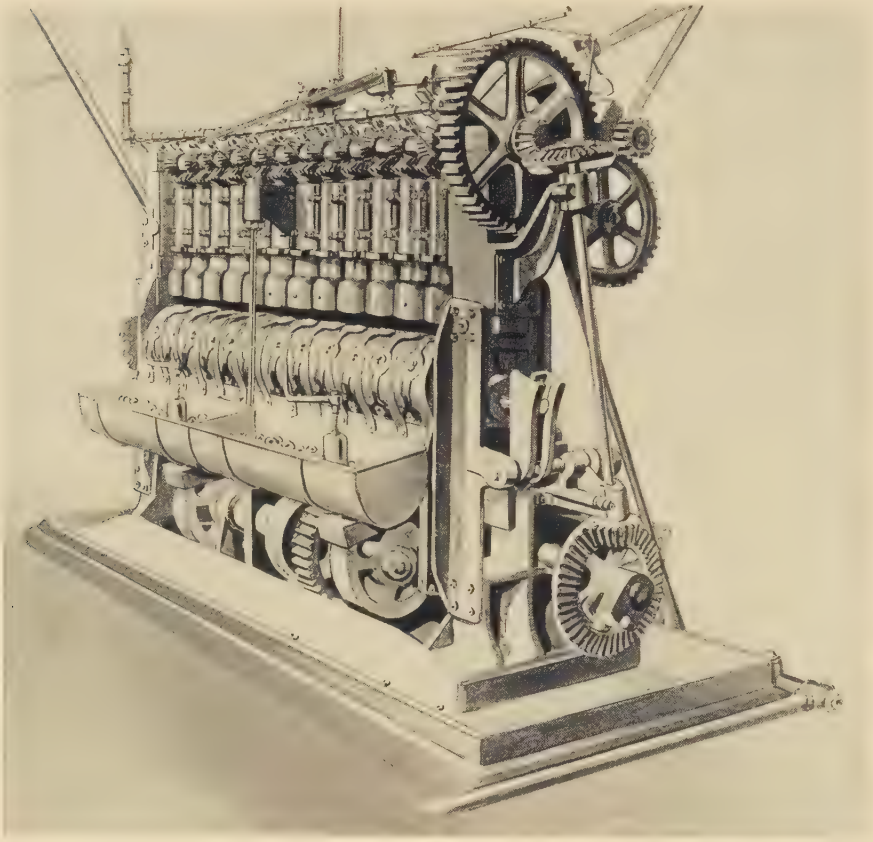
TEN-CHUCK AUTOMATIC TAPPING MACHINE

This is merely a different form of the four-chuck machine shown on preceding page, and embodies the same principles.



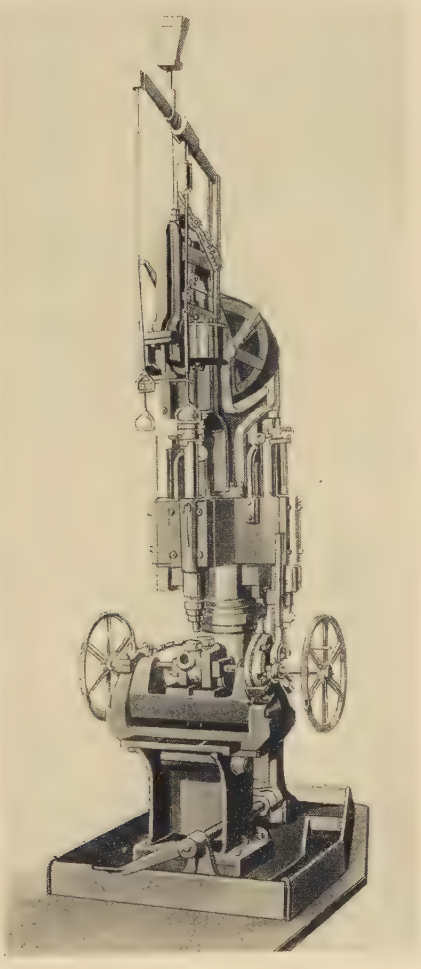
HOPPER OR MAGAZINE MACHINE

Under the old method it was necessary for the operator to work the chuck by hand, necessitating much extra labor, but with the machine here illustrated, the operator needs only to insert the fitting, the remaining operations, such as tapping, clearing the chuck, etc., being performed by the machine automatically.



TWELVE-SPINDLE TAPPING MACHINE FOR FINISHING MALLEABLE UNIONS

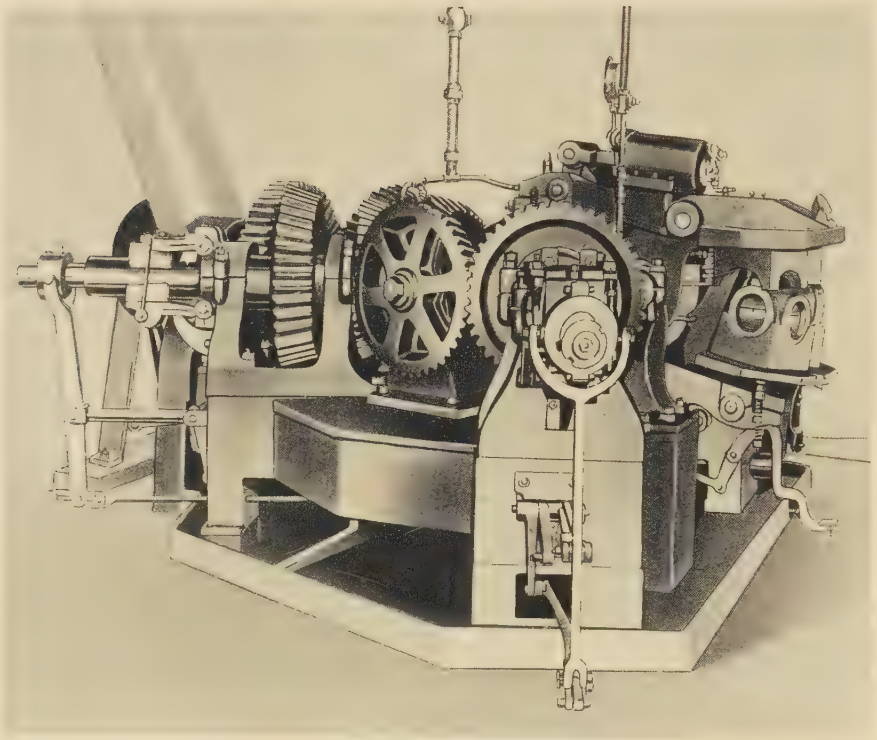
This machine is also strictly automatic, the only labor required of the operator being to insert the work in the chuck and remove it when finished.



VERTICAL FOUR-SPINDLE MONITOR TAPPING MACHINE

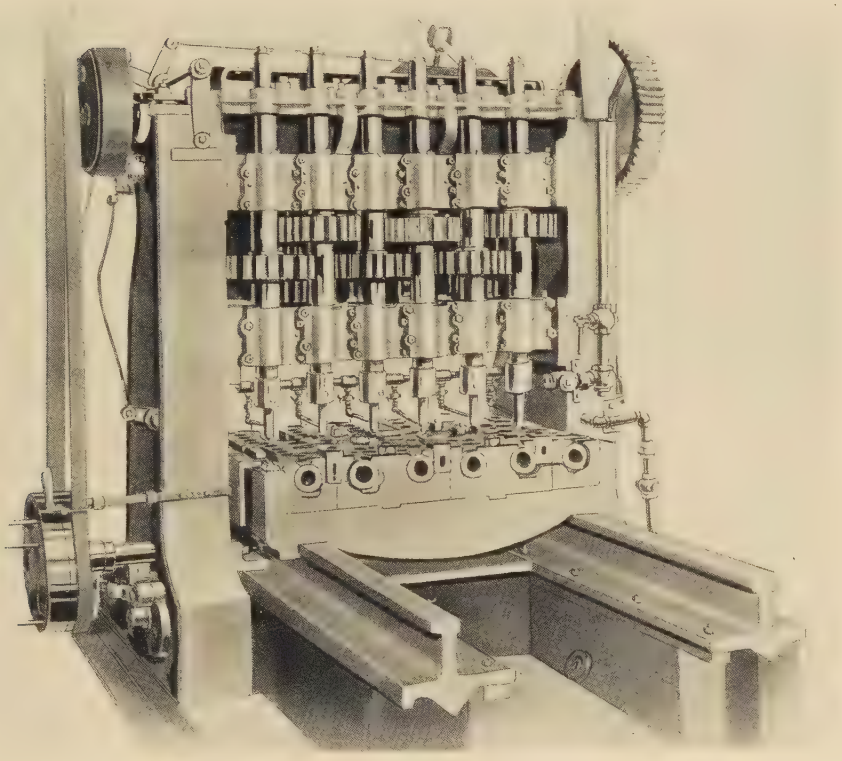
In this machine each spindle holds a different size tap, any one of which can be brought around for use when required, thus avoiding the necessity of stopping the machine to change tools, etc.

It was designed especially for tapping fittings having outlets of different sizes.



FOUR-SPINDLE MACHINE WITH POWER-OPERATED CHUCK FOR TAPPING TWO ELBOWS AT ONCE

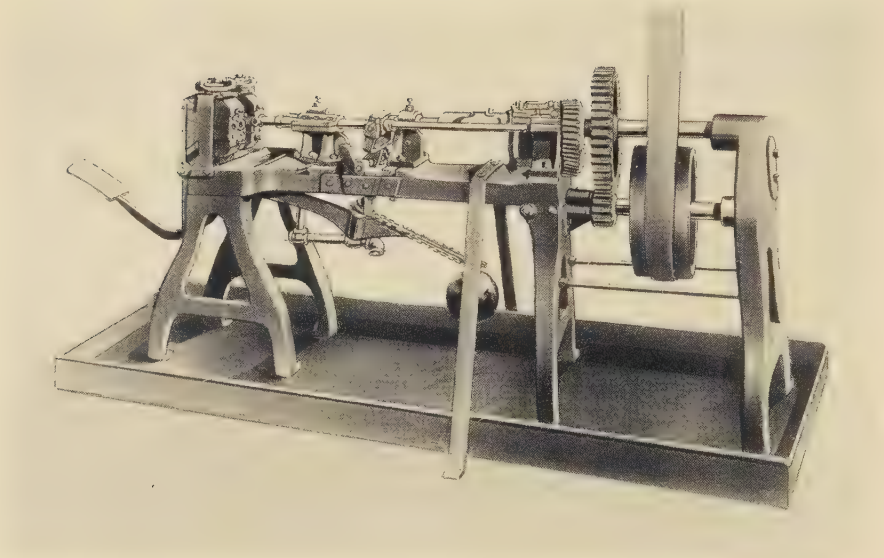
With this machine the clamping is done by an air cylinder operated through a toggle joint, which is a great improvement on the old method of using screws for clamping.



BRANCH TEE TAPPING MACHINE

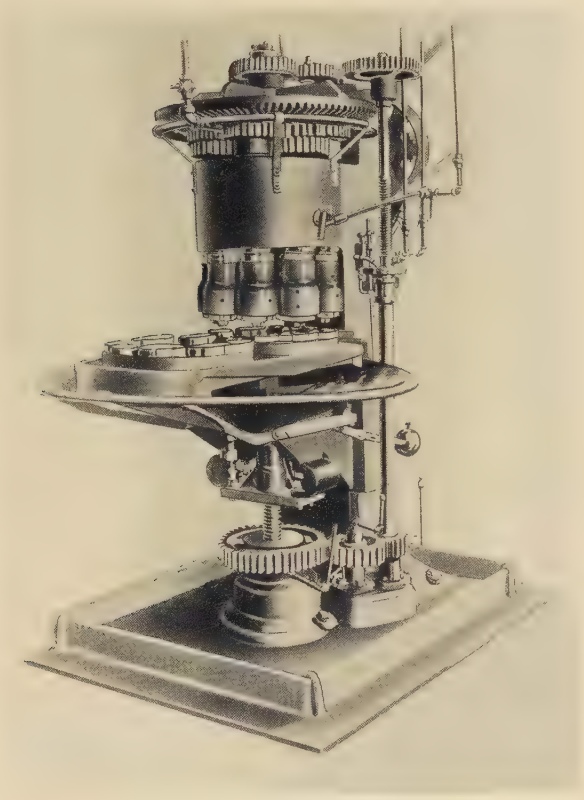
In this machine the branch tees are arranged in six parallel rows, and one hole in each of these tees is tapped at one time.

In this way much stronger gears can be used than would be possible if we tried to tap all the holes in a single casting in one operation, as then the holes would be so close to each other that the gears would not stand the strain.



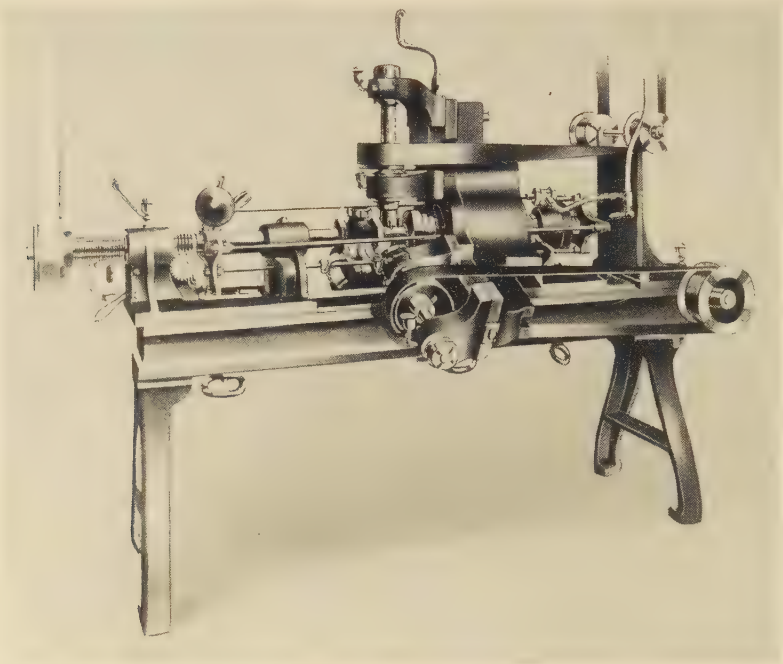
TWO-SPINDLE RETURN-BEND TAPPING MACHINE

This machine taps bends of different pitches and angles, and is the oldest in the history of our company.



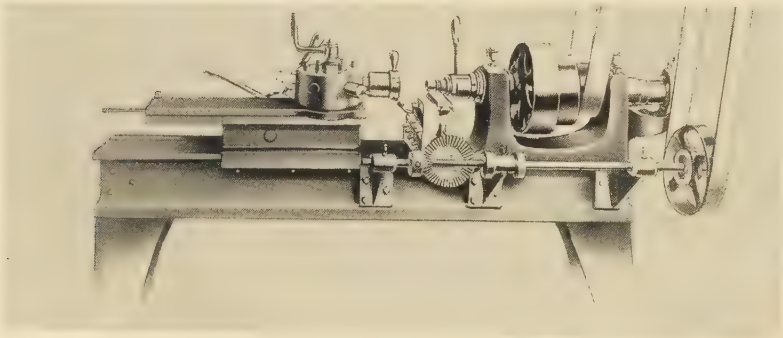
EIGHT-SPINDLE TAPPING MACHINE WITH REVOLVING TABLE FOR CUTTING PLUGS AND BUSHINGS

This is another of our automatic machines. The revolving table allows one end to be loaded while the other one is working.



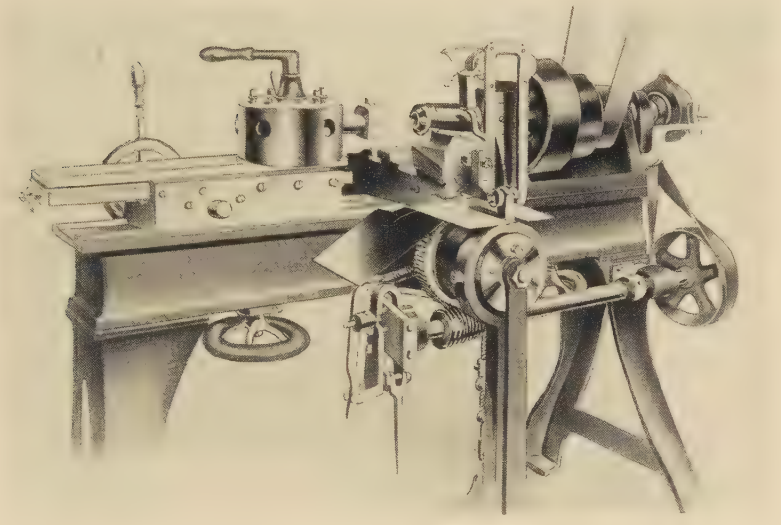
THREE-WAY MILLING MACHINE FOR BRASS

This machine mills three sides of a hexagon at one time, after which the work is turned half way around and the remaining three sides are milled.



MACHINE FOR FINISHING CENTER-PIECES OF BRASS VALVES

This is similar in operation to the machine illustrated above.

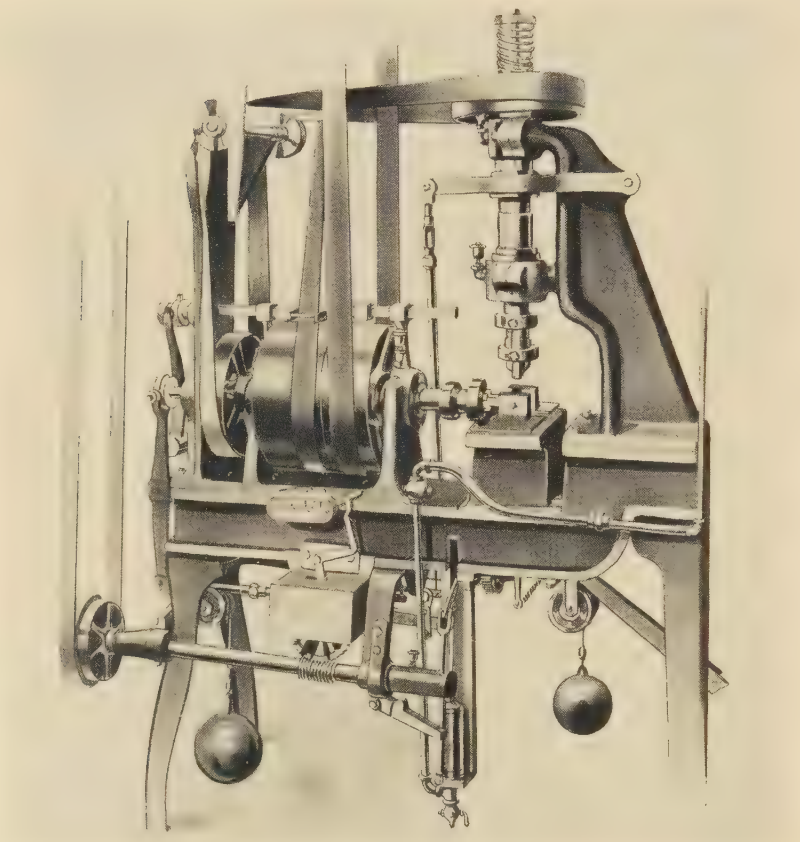


UNDER-CUT MACHINE USED IN FINISHING BRASS GOODS

This machine contains a tool of the same shape as the article to be finished, which tool is placed on a slide rest and then forced against the casting, taking off the entire surface in one cut or operation.

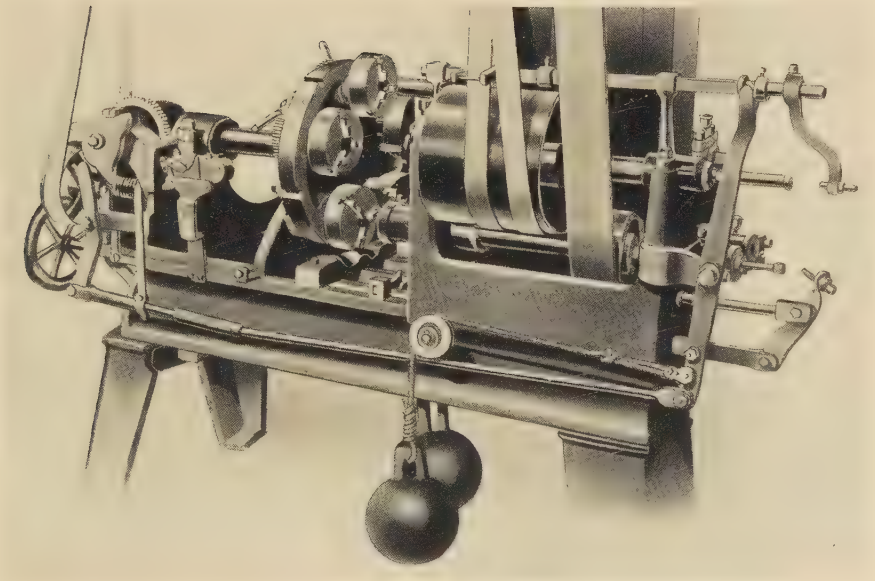
This device not only is absolutely accurate but is exceedingly rapid in operation, producing probably fifty times more work than could be obtained under the old methods.

It is the most important invention ever made in finishing brass goods, and to-day is used extensively throughout the country in many lines of work, but, owing to the pressure of business, we neglected to have it patented.



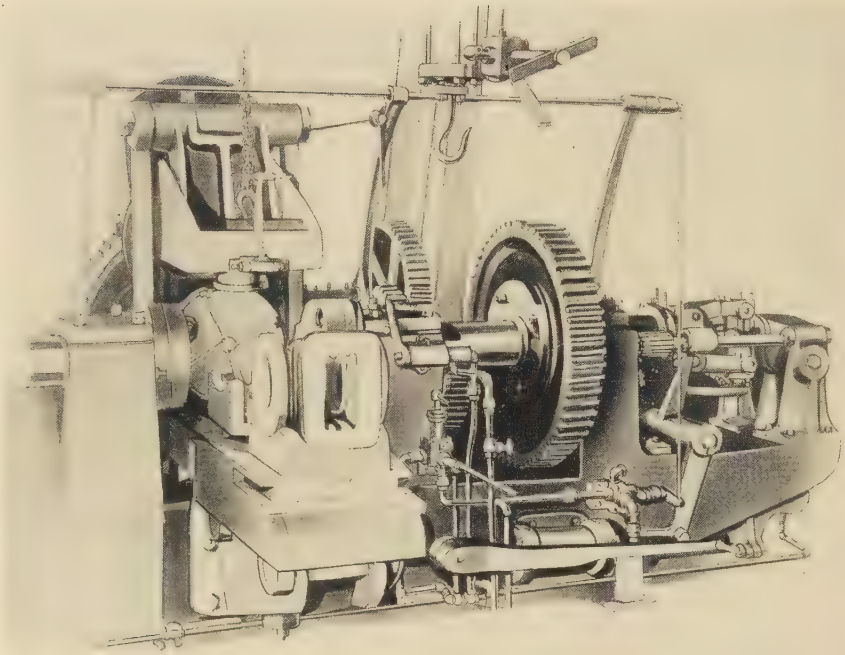
MACHINE FOR BORING AND TAPPING
VALVE BODIES

In this machine the valve bodies are bored and faced on one spindle, and then are thrown over and tapped on the second spindle.



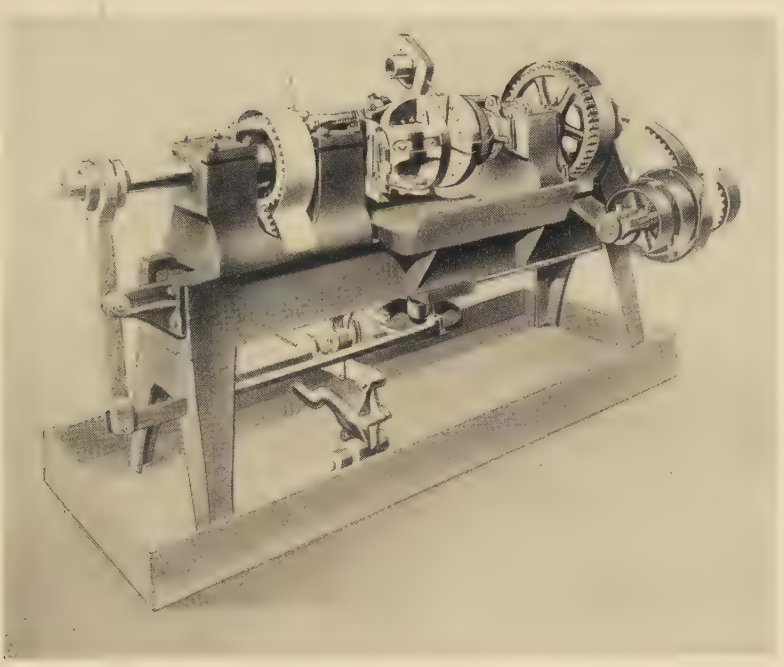
MACHINE FOR TAPPING, REAMING AND THREADING VALVE CENTER-PIECES

With this machine, after the work is placed in the chuck the latter revolves, so that one set of spindles performs one operation (such as facing and boring,) the next does the tapping, the next the reaming, etc.



THREE-WAY HORIZONTAL FACING MACHINE

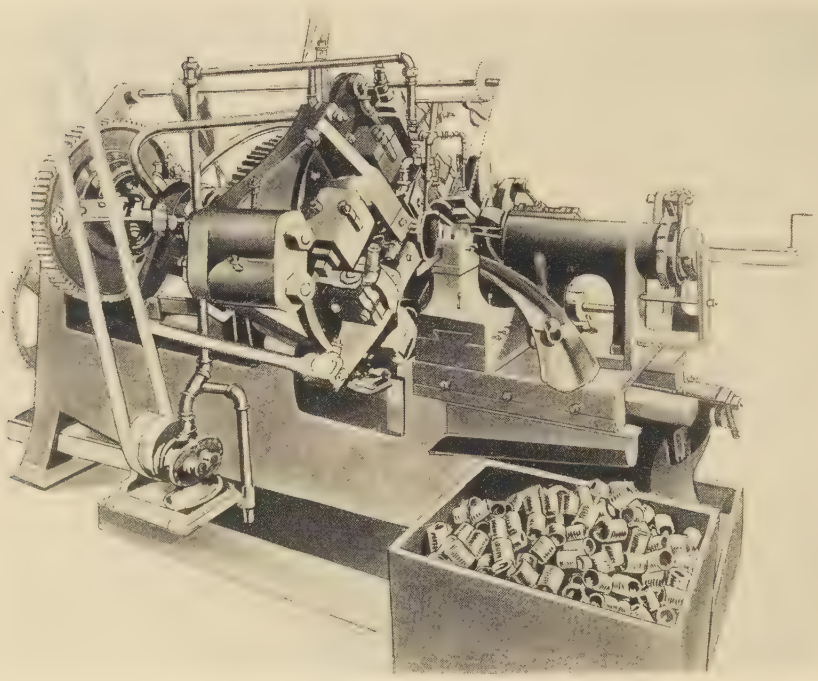
In order to get under the scale easily and thus save wear on the tools, the face of the casting to be machined is corrugated similar to the face of a washboard. The tools are forced against this corrugation, finishing the entire face of the casting in one cut.



TWO-SPINDLE NIPPLE MACHINE

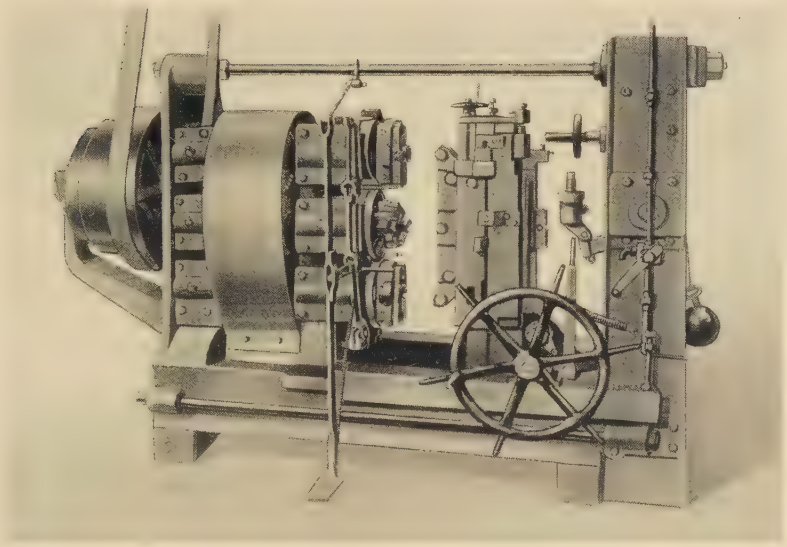
This machine threads both ends of a nipple at the same time, provided the nipple is long enough to allow the gripping device to take hold.

In making close nipples the pipe, after being threaded, is cut in two and then the nipple is caught by the gripping device and threads cut on the other end.



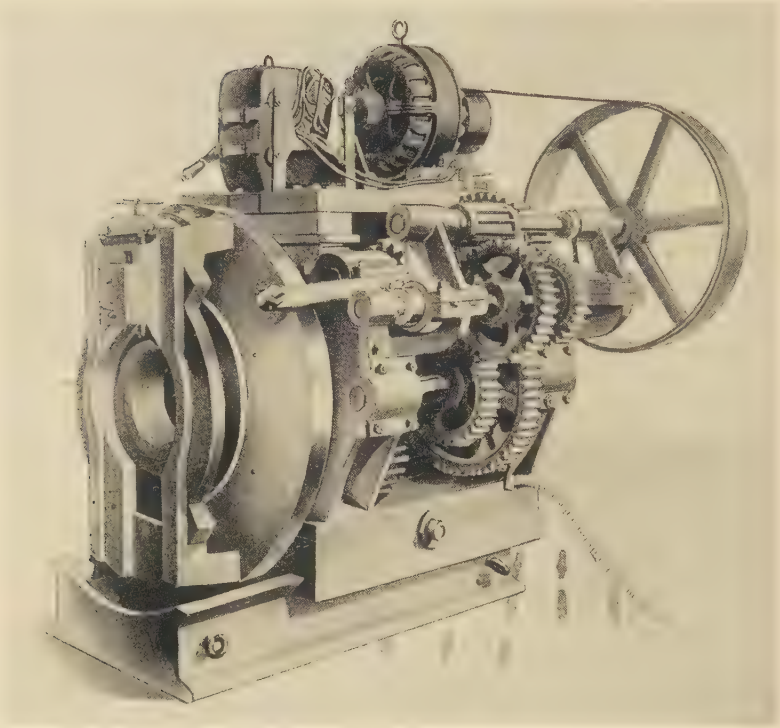
AUTOMATIC NIPPLE CUTTING MACHINE

A full length of pipe is inserted in this machine, where it is threaded in the shape of an hour-glass. Then, as the pipe is moved along and the dies commence to cut the second thread, the cutting off tools come into action and cut the pipe in two at the smallest diameter of the "hour-glass," at the same time chamfering the ends. Thus a complete nipple is produced without any labor other than that required to place the pipe in the machine.



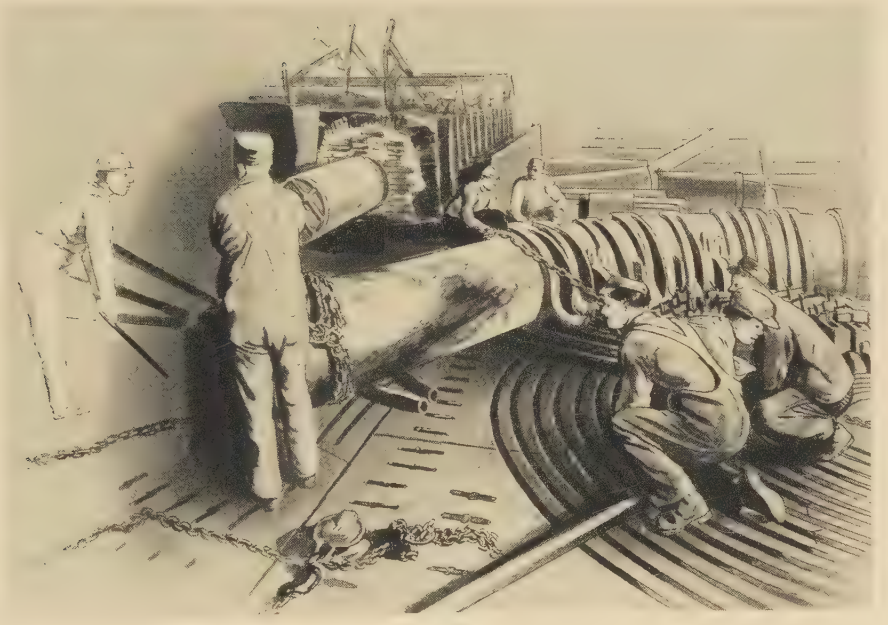
THREE-SPINDLE MONITOR FOR ROLLING RINGS ON VALVE DISCS

This machine simply performs the operations of three spindles at once, instead of only one.



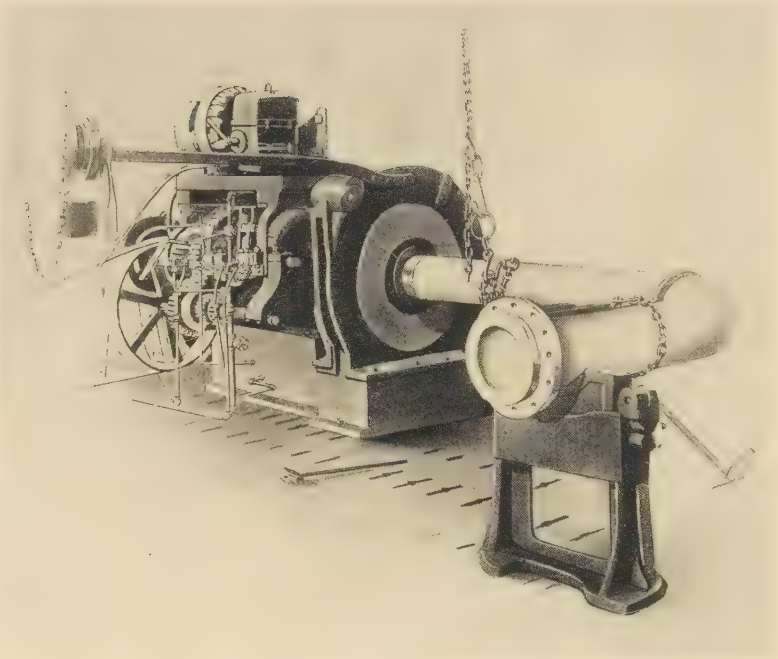
PORTABLE MACHINE FOR FACING PIPE BENDS

In this machine the finished bends are set, then cut off to the right length and threaded, after which flanges are screwed on and faced in one setting, thereby producing very accurate work.



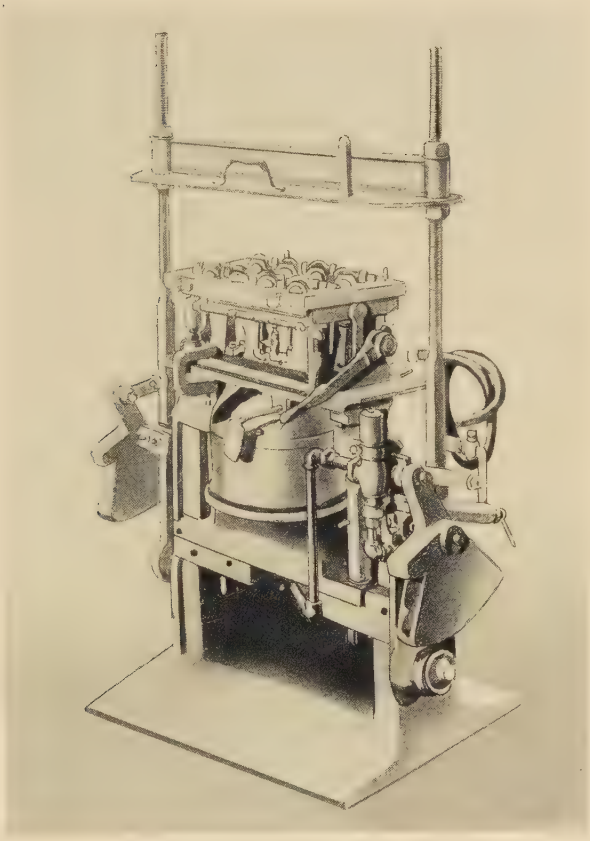
FURNACE AND PIPE BENDING PLATE

In this process the pipe is filled with sand and heated, and then is bent around forms fastened to the bending plate.



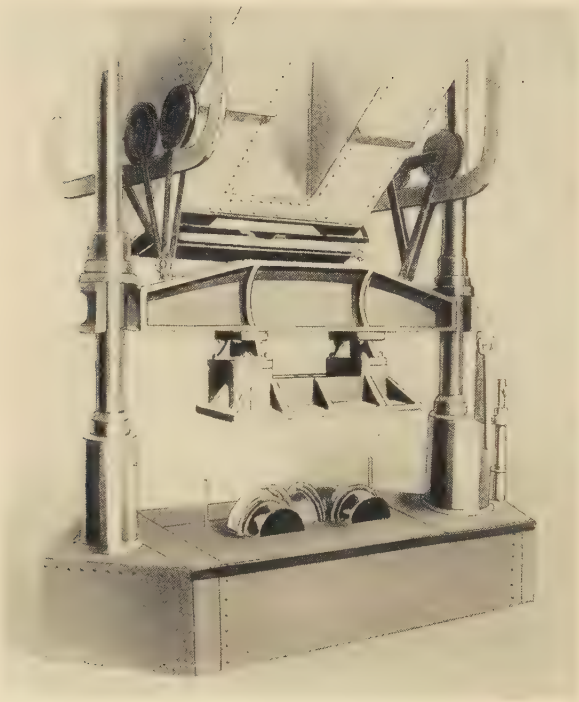
MACHINE AND FURNACE FOR WELDING FLANGES ON PIPE AND MAKING LAP JOINTS

Previous to the introduction of the machine here illustrated we welded flanges on straight lengths of pipe by the use of a steam or power hammer and then endeavored to bend the pipe to the required dimensions, which was very difficult to do. With this machine the work of welding on flanges or making lap joints is performed after the pipe is bent.



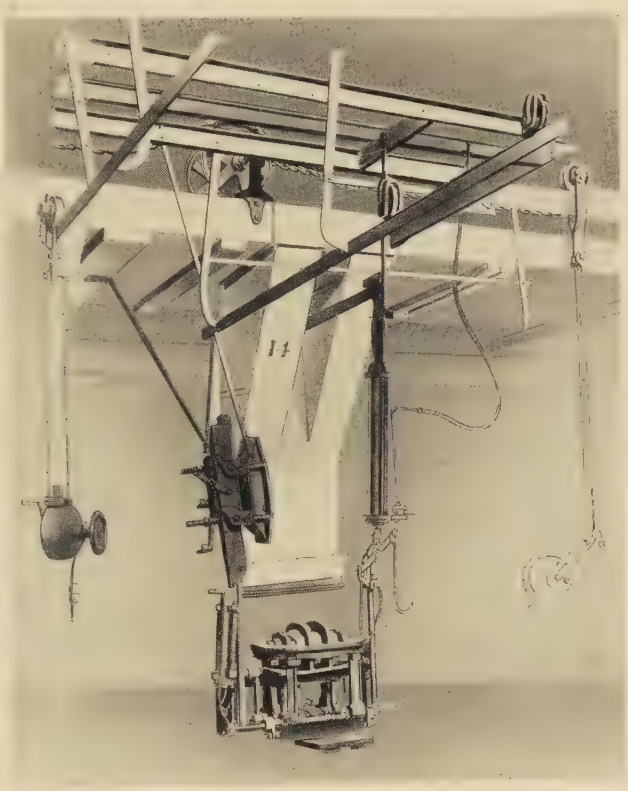
AIR PRESS MOLDING MACHINE

This type of machine is fitted with our original strain bar and side rods, which attachments were used for many years but now are almost entirely dispensed with.

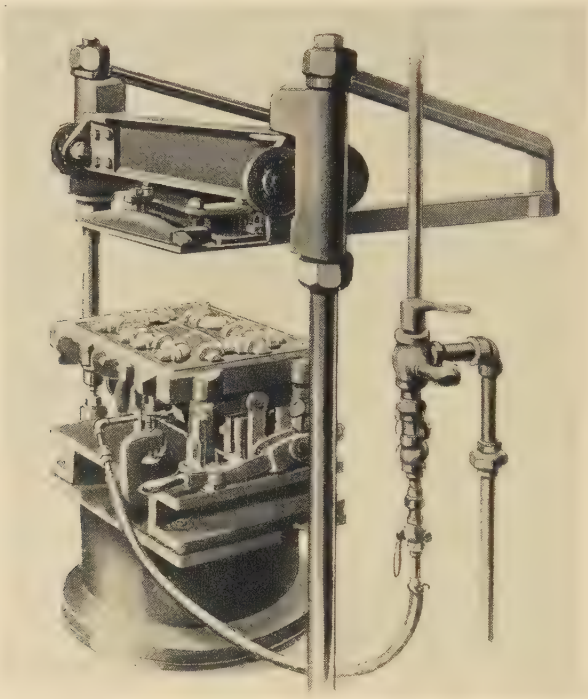


44-INCH MOLDING MACHINE FOR VALVES AND FITTINGS

This is one of the most powerful air press machines ever produced for molding valves and fittings and has a range of from 10 inches to 16 inches. It contains one 36-inch and one 44-inch pressure cylinder, which can be used separately or combined as may be desired.



AIR PRESS MOLDING MACHINE SHOWING OVER-HEAD MACHINERY



AIR PRESS MOLDING MACHINE WITH ROLLER STRAIN BAR

This illustration shows the roller strain bar, which has entirely superseded the type of bar shown on the preceding page.

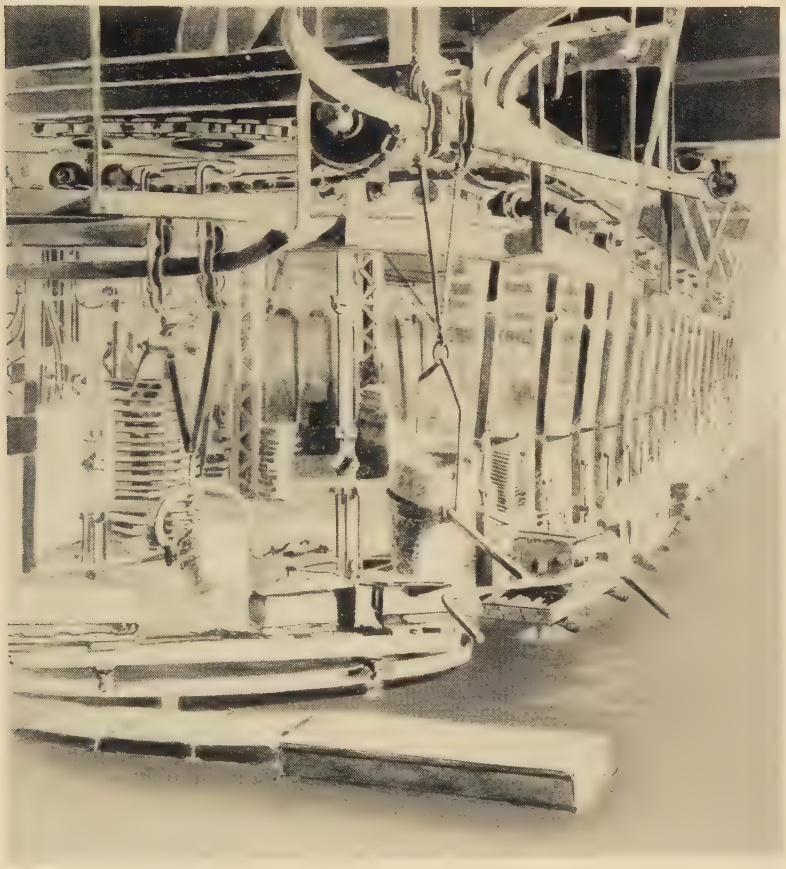
On page 142 will be found a description of my first invention, which consisted of putting one-half of a pattern on each side of the plate. The molding machines illustrated in the present chapter show how that idea afterwards was taken up and the pattern arranged in such a way that it could be drawn down through the plate, thereby insuring a mold that is more nearly perfect than can be obtained by lifting the sand from the pattern.

From time to time various means of pressing the sand in the molds, such as the hand press, the air press, etc., were introduced; also a number of different methods were tried for manipulating the strain bar across the top of the mold.

During the past few years my original method for making molds, referred to above, has become the favorite one for a large amount of small work by adding to the machine a vibrator, which device jars the pattern, thereby aiding in drawing it out of the sand.

A great saving also is obtained in the wearing of the patterns. When patterns were drawn through the plate they wore out so quickly at the

edges that it was necessary to renew them often, which was overcome by fastening the pattern to the plate and using the vibrator.



CARRIER SYSTEM WITH MOVABLE PLATFORM
CAST IRON FITTINGS FOUNDRY, DEPARTMENT 2

PLEASANT MEMORIES

TESTIMONIALS AND ANNIVERSARY CELEBRATIONS

FOR a person to be engaged in business as long as I have been and not to earn the good-will and esteem of his employes would be almost a calamity and one of the greatest pleasures which I have been permitted to enjoy is the satisfaction of knowing that I have not failed in this respect.

Evidences of loyalty and good-will on the part of our workmen have been manifested on many occasions, but I shall mention here only the most important of these, at the same time recording briefly our principal business anniversary celebrations.

TEA SERVICE

PRESENTED IN 1871

When my brother Charles retired from our company in 1871 our workmen presented each of us with a silver tea service, as here illustrated. The set which I received has been in continual use in our family since that time and we prize it very highly, not only for its associations, but for its beautiful and artistic design.

FORTIETH ANNIVERSARY, 1895

ON JULY 4th of this year we celebrated the fortieth anniversary of my starting in business by giving our employes and their families a picnic at Desplaines, Ill.

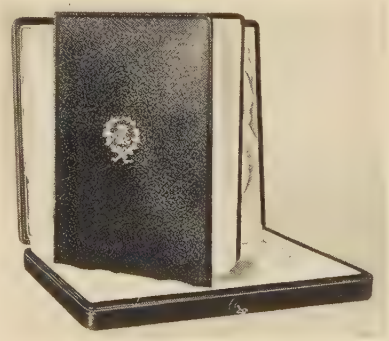
This proved a great success, the attendance being very large and every one entering fully into the spirit of the event.

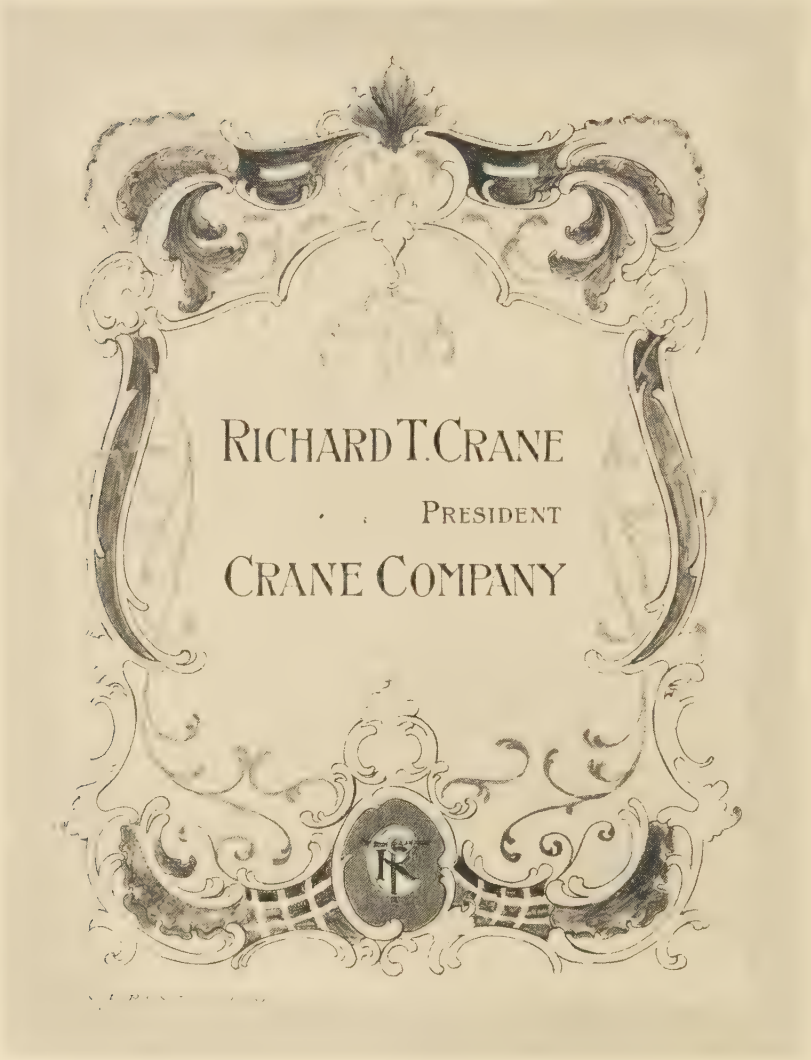
On this occasion I delivered an address to our workmen, copy of which will be found in the collection of my writings.

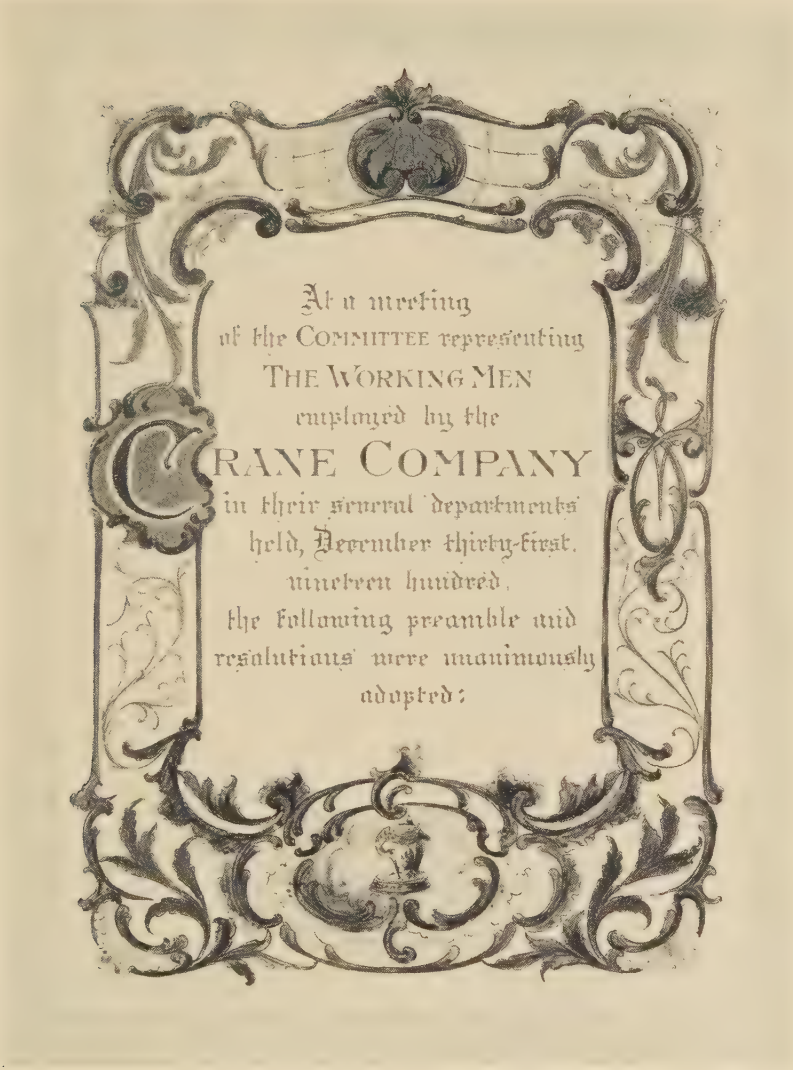
As a testimonial of this anniversary the officers, superintendents and foremen of our company presented me with a beautiful and artistic bronze crucible of special design (as shown here), which I value very highly.

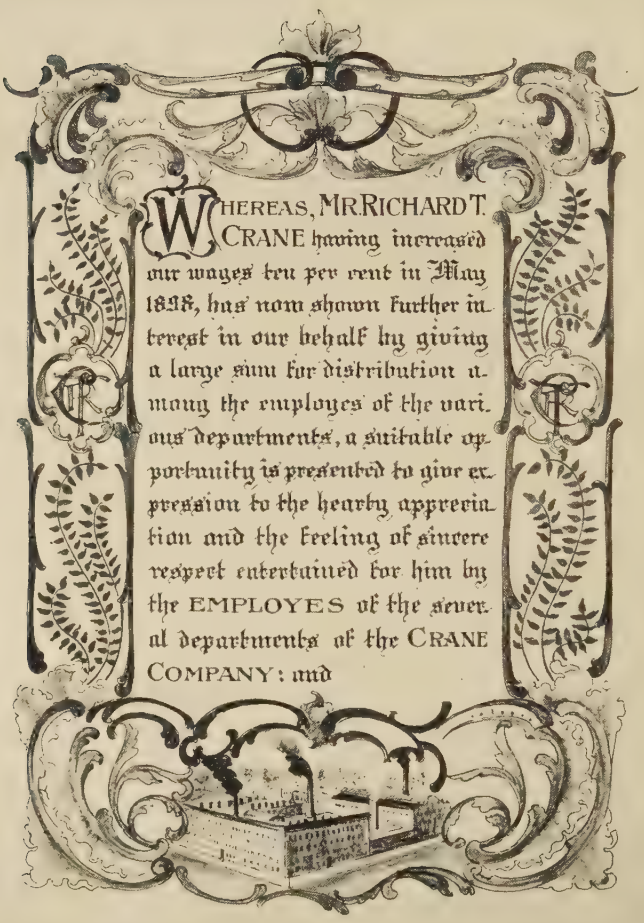
RESOLUTIONS PRESENTED BY OUR WORKMEN, 1900

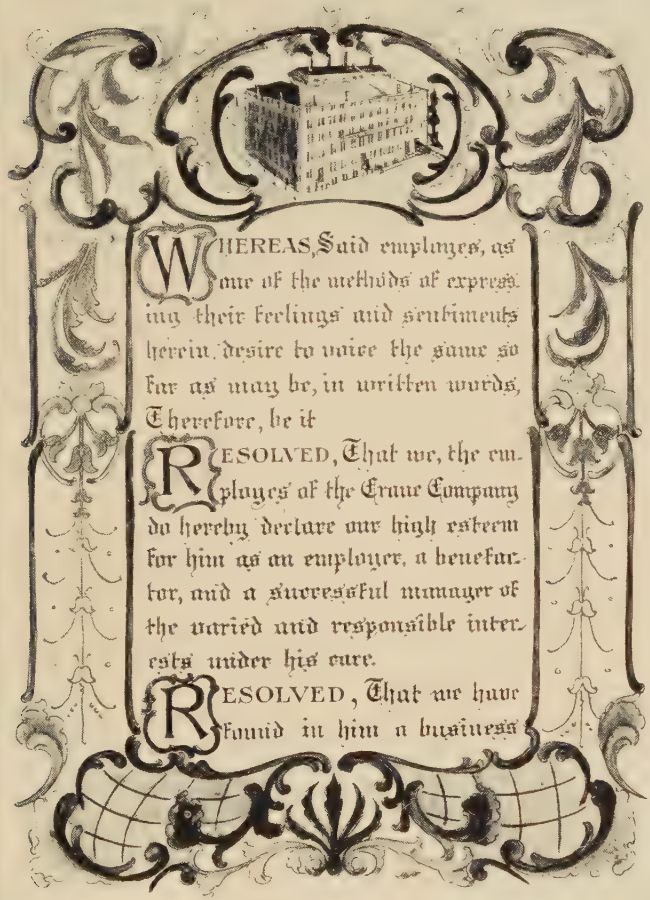
At the close of this year I received from our workmen a copy of the following Resolutions, beautifully engrossed and bound in a very handsome leather cover containing twenty-one diamonds. When these Resolutions were presented I was deeply affected by the sentiments therein expressed and I regard this testimonial as one of my most cherished possessions.




RICHARD T. CRANE
PRESIDENT
CRANE COMPANY


At a meeting
of the COMMITTEE representing
THE WORKING MEN
employed by the
CRANE COMPANY
in their several departments
held, December thirty-first,
nineteen hundred,
the following preamble and
resolutions were unanimously
adopted:


WHEREAS, MR. RICHARD T. CRANE having increased our wages ten per cent in May 1898, has now shown further interest in our behalf by giving a large sum for distribution among the employes of the various departments, a suitable opportunity is presented to give expression to the hearty appreciation and the feeling of sincere respect entertained for him by the EMPLOYES of the several departments of the CRANE COMPANY: and



WHEREAS, Said employees, as some of the methods of expressing their feelings and sentiments herein, desire to voice the same so far as may be, in written words, Therefore, be it

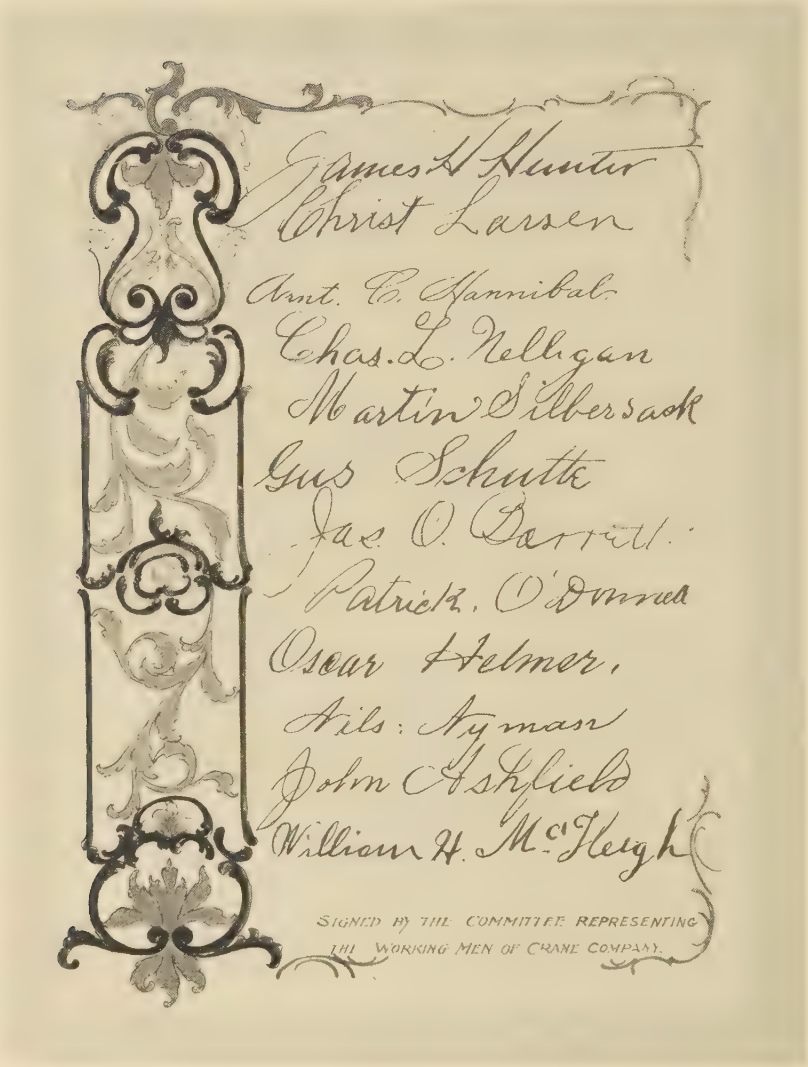
RESOLVED, That we, the employees of the Crane Company do hereby declare our high esteem for him as an employer, a benefactor, and a successful manager of the varied and responsible interests under his care.

RESOLVED, That we have found in him a business

man who, while faithfully laboring to advance the proprietary interests in his keeping, has also labored to secure the material and personal well-being of the men in his employment. We have found him to be actuated by a just desire to elevate labor, to augment the comforts and opportunities of the wage-worker and his family, and to bring within their reach and control, increased facilities for knowledge, culture and rational enjoyment. With great satisfaction

and pleasure we have seen his earnest endeavors on these lines culminate in practical results and crowned with success.

RESOLVED, That we hold in GRATEFUL REMEMBRANCE the generous sentiment he has always manifested towards the employes of these works, and his continued efforts to secure and promote their welfare; and that our earnest wish is that many years of prosperity may be his and that peace and joy shall ever abide with him.


James L. Hunter
Christ Larsen
Ant. C. Hannibal
Chas. L. Nelligan
Martin Silbersack
Gus Schutte
Jas. O. Barrett
Patrick O'Donnell
Oscar Helmer
Nils Nyman
John Ashfield
William H. McHugh
SIGNED BY THE COMMITTEE REPRESENTING
THE WORKING MEN OF CRANE COMPANY.

BRONZE STATUE OF "MUSIC" PRESENTED BY THE OFFICE EMPLOYES

50th ANNIVERSARY, 1905

IN CELEBRATION of our Fiftieth Anniversary we again gave our employes and their families a picnic at Desplaines, Illinois. The attendance was very large, the total number present being about thirteen thousand.

One feature of this anniversary was a special trip to Lake Geneva, which was tendered to our Branch House Managers and their wives. A detailed account of this Jubilee and copy of the address which I delivered was published in The Valve World for July of that year.

On this occasion I was presented by our office employes with a bronze statue representing Music, and from our Branch House Managers I received a beautiful gold loving cup, both of which articles are here illustrated.

FIFTY-FIFTH ANNIVERSARY

THIS anniversary was also celebrated by a picnic for our employes and their families, which was held at Riverview Park, and was fully as successful as the preceding ones. It was attended by probably twenty thousand persons and it is interesting to note that among them were ninety-six who had been in the company's employ for a period of twenty-five years or longer.

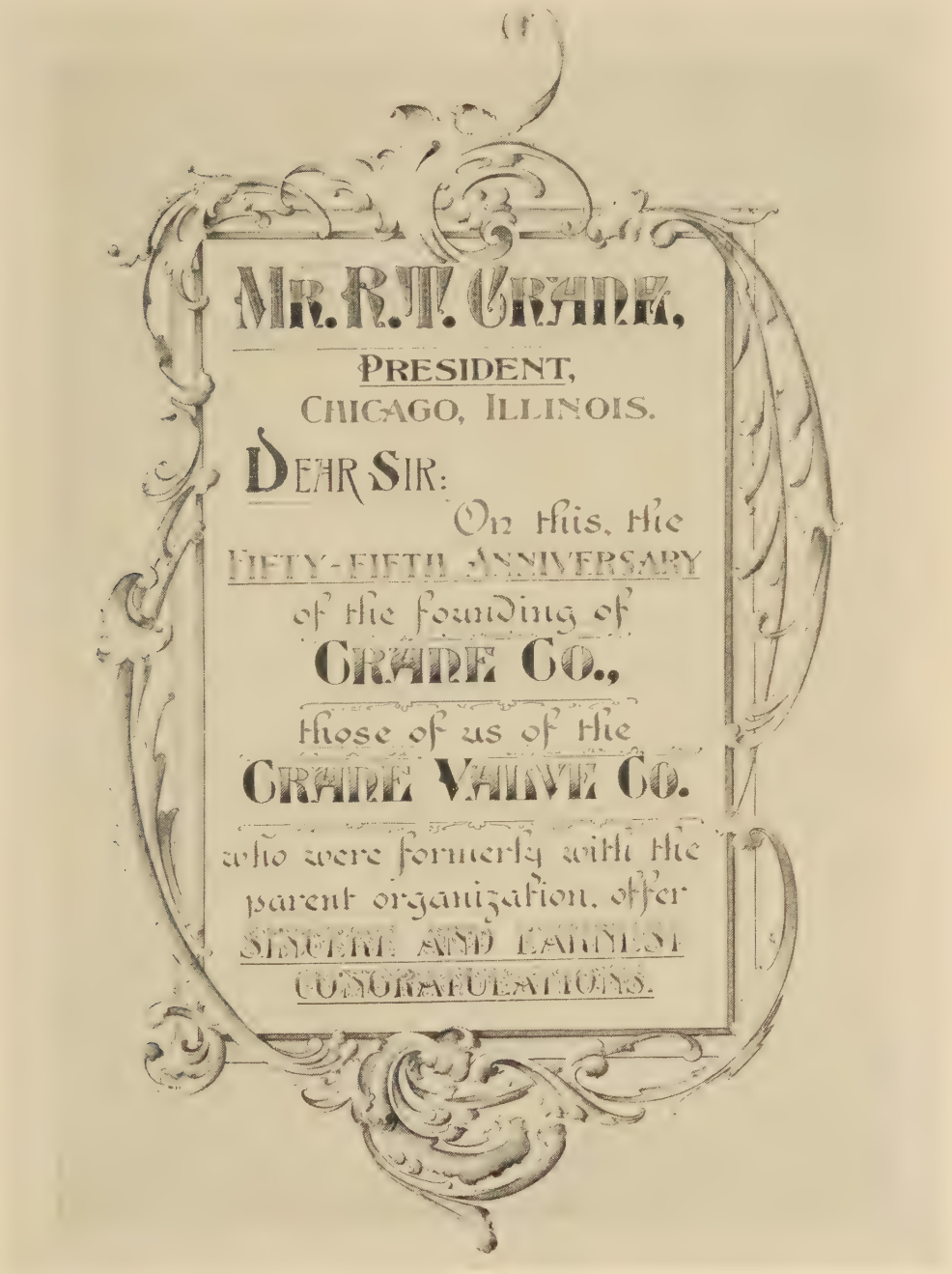
On this occasion I again delivered an address to our employes, a copy of which, together with a full account of this celebration, including the reception tendered to the Branch House Managers and their wives at Lake Geneva, will be found in The Valve World for July of that year. The following illustrations show the testimonials which were presented to me in commemoration of this anniversary.

GOLD LOVING CUP PRESENTED BY BRANCH HOUSE MANAGERS

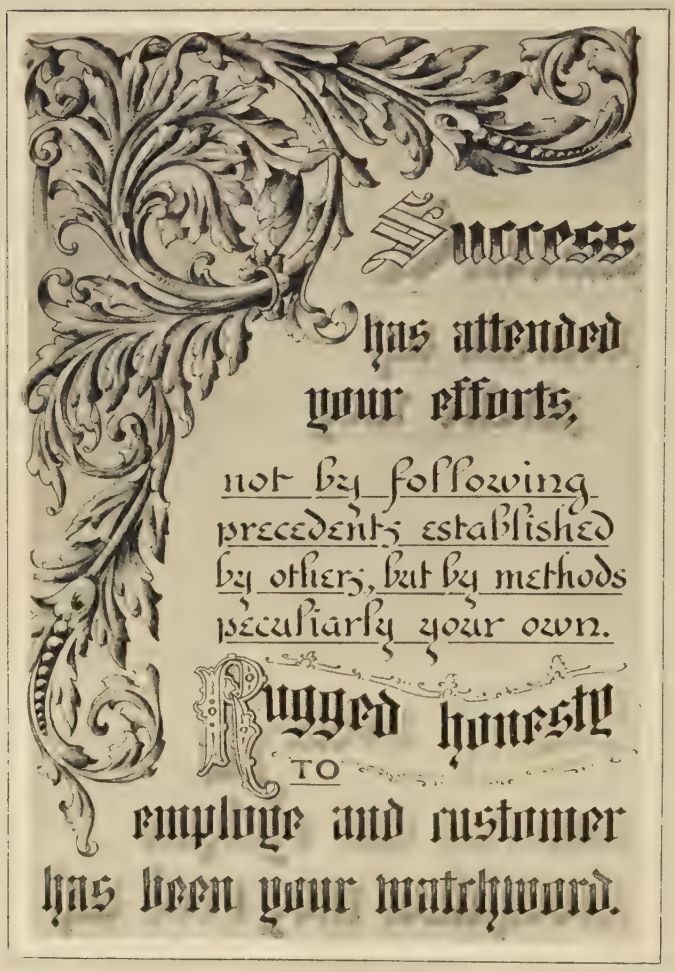
SILVER TEA SERVICE
FROM DIRECTORS, OFFICERS, SUPERINTENDENTS AND HEADS OF DEPARTMENTS

"VOX PROGRESSI"
BRONZE GROUP FROM
BRANCH HOUSE MANAGERS

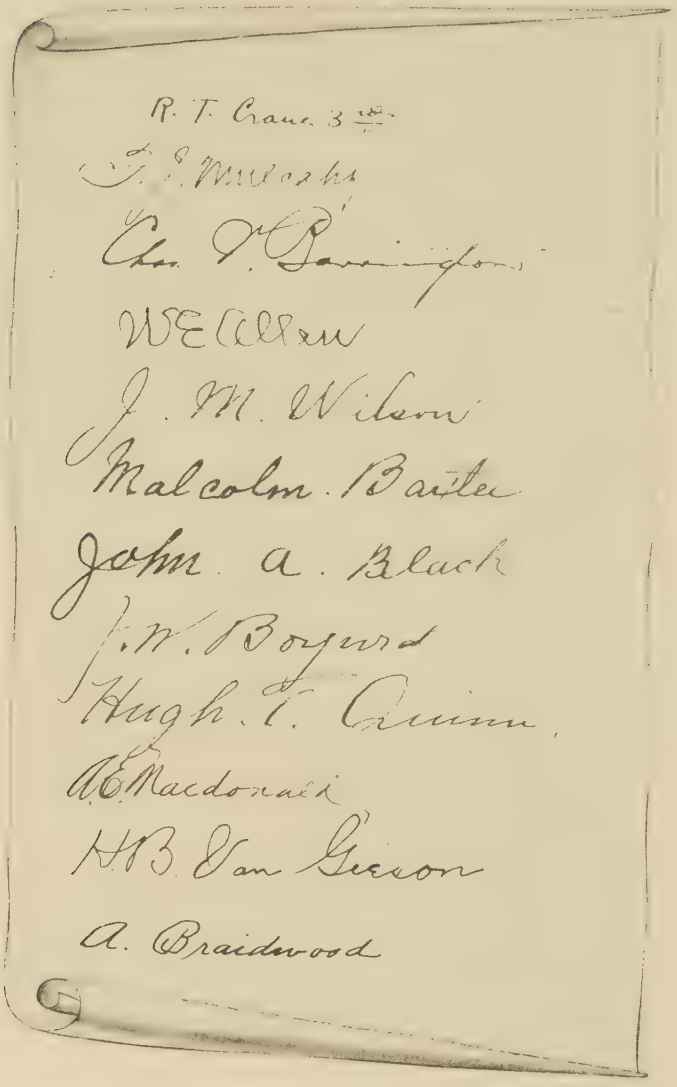
LOVING CUP
PRESENTED BY BRANCH
HOUSE EMPLOYES

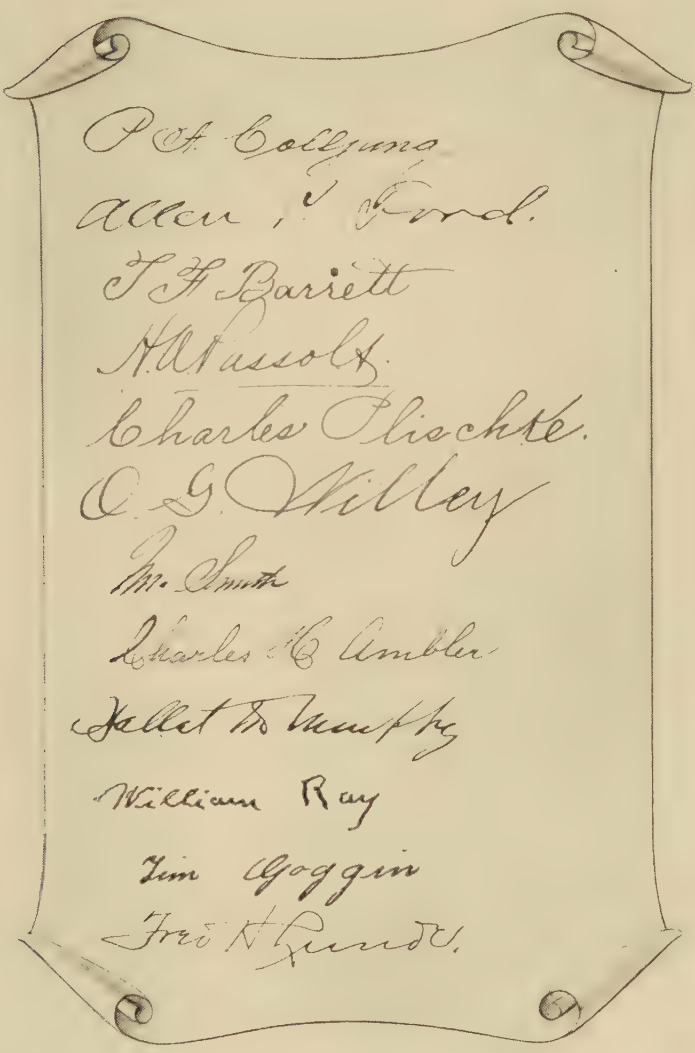


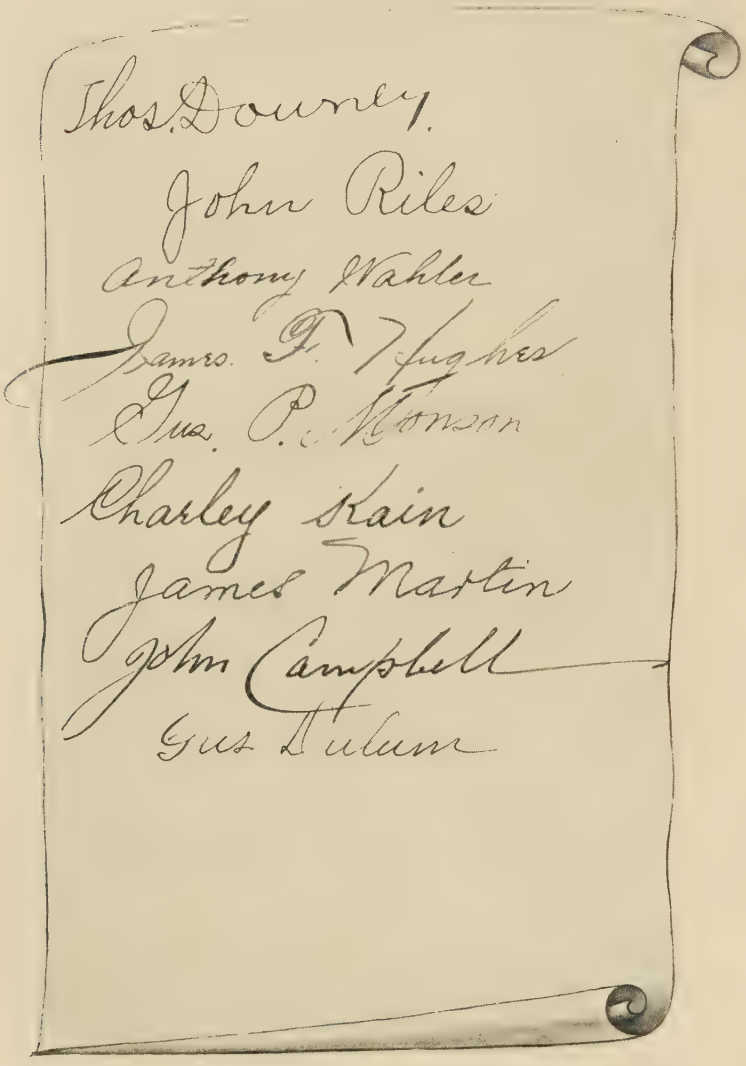
BOOK OF GREETINGS FROM BRIDGEPORT EMPLOYES


Success
has attended
your efforts,
not by following
precedents established
by others, but by methods
peculiarly your own.
Rugged honesty
TO
employe and customer
has been your watchword.

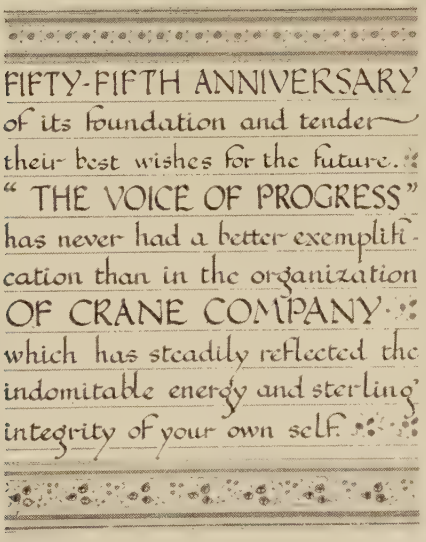
Receive from us
HEARTIEST
WISHES
for the prolongation
of your health and
vigor, and the hope
for a continuance of
the benefits of your
guiding hand.
Yours with sincere respect,
BRIDGEPORT, CONNECTICUT,
JULY FOURTH, 1910.

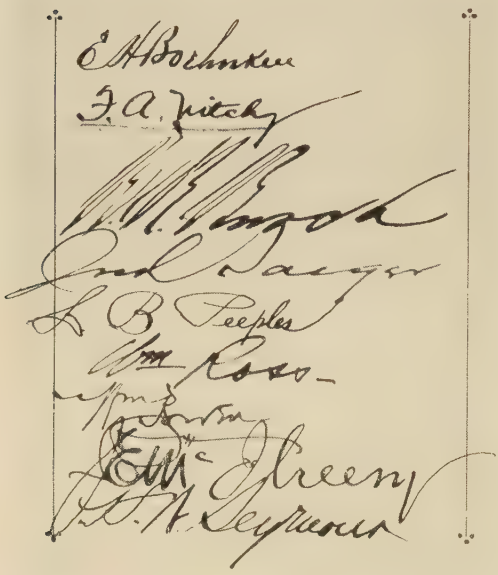

R. T. Crane Jr.
Chas. H. Barrington
W E Wilson
J. M. Wilson
Malcolm Bailie
John A. Black
J. W. Boyard
Hugh T. Quinn
A. E. Macdonald
H B Van Gieson
A. Braidwood

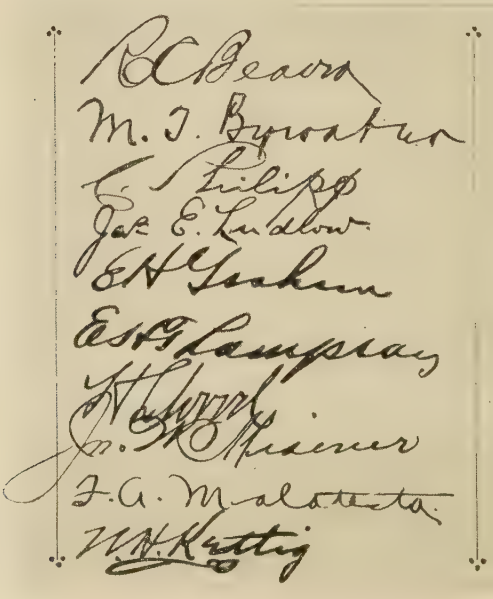

P. A. Collins
Allen, Jr. Ford.
J. F. Barrett
H. Russell.
Charles Plischke.
C. G. Kelley
M. Smith
Charles C. Ambler
Hallet D. Murphy
William Ray
Jim Goggin
Fred N. Lund.

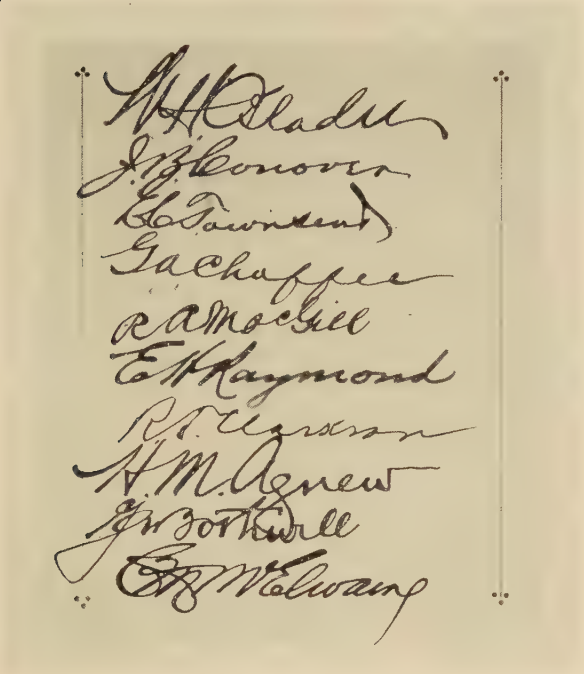

Thos. Downey
John Riles
Anthony Wahler
James F. Hughes
Gus. P. Monson
Charley Kain
James Martin
John Campbell
Gus Tulan

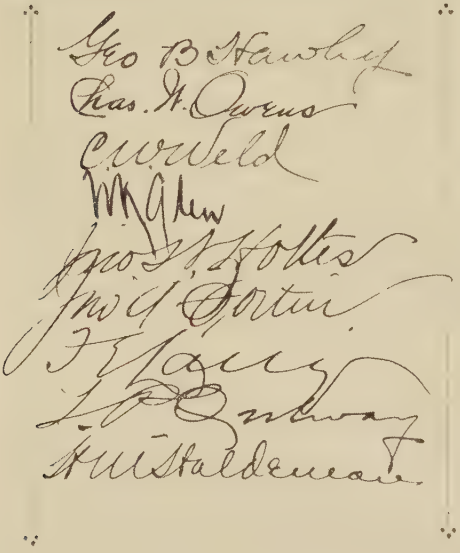
GREETINGS AND SIGNATURES OF THE BRANCH HOUSE MANAGERS ACCOMPANYING THE GIFT OF THE BRONZE STATUE "VOX PROGRESSI"


FIFTY-FIFTH ANNIVERSARY
of its foundation and tender
their best wishes for the future.
" THE VOICE OF PROGRESS "
has never had a better exemplification than in the organization
OF CRANE COMPANY
which has steadily reflected the
indomitable energy and sterling
integrity of your own self.









THE MALLEABLE IRON FOUNDRY
DEPARTMENT 3

THE malleable iron foundry, which was erected in 1909, and was in efficient operation prior to the death of Mr. R. T. Crane, received only general mention in his autobiography, and inasmuch as it represents the then height of development of the business along mechanical lines, in efficiency of operation and perfection of arrangement, a somewhat detailed description of it now seems justified.

Another reason for including as a part of this record of the business a full account of his malleable foundry is that, in the new factories now under construction (1913), all the manufacturing departments of the company will be housed in two-story buildings, whereas those about to be abandoned because of their location on expensive land near the center of the city are four and five stories in height. Necessarily these two types of buildings differ greatly in their internal arrangements.

Beyond question our malleable iron foundry here described, which represents the accumulated experience of the company during its long history, is the acme of design and arrangement for a high foundry building.

MALLEABLE IRON FOUNDRY
SOUTH CANAL AND FIFTEENTH STREETS

Erected 1909. Building 225 x 177 feet.

Reinforced steel concrete throughout with brick facing. Cost of building approximately $646,000.

The different floors are used as follows:

BASEMENT—Storing raw material.

FIRST FLOOR—Office —Shipping—Storing finished product.

SECOND FLOOR—Machine shops.

THIRD FLOOR—Core room—Machining Unions.

FOURTH FLOOR—Cleaning and assorting castings —Annealing.

FIFTH FLOOR—Foundry—Galvanizing.

GALLERY ABOVE FIFTH FLOOR—Charging platform —Machinery for mixing and preparing sand for molding.

The company's engineering department worked out in detail all the interior arrangements of the building, the architects merely designing the foundations and the building itself.

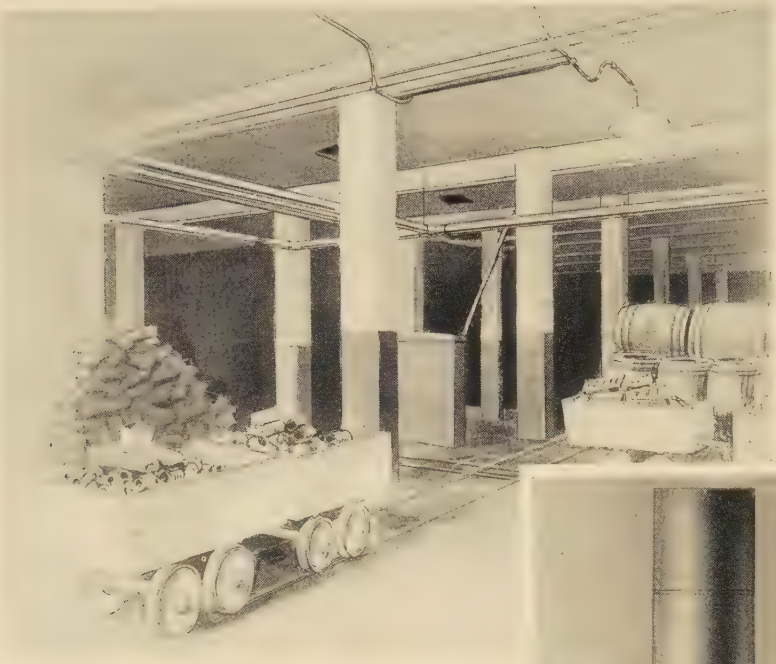
Wherever possible the various conveyors, machinery, foundations, core ovens, galvanizing furnaces, etc., were erected integral with the building. This required the utmost care and forethought, and credit is due to the company's forces and not to outsiders for the success with which these details were worked out.

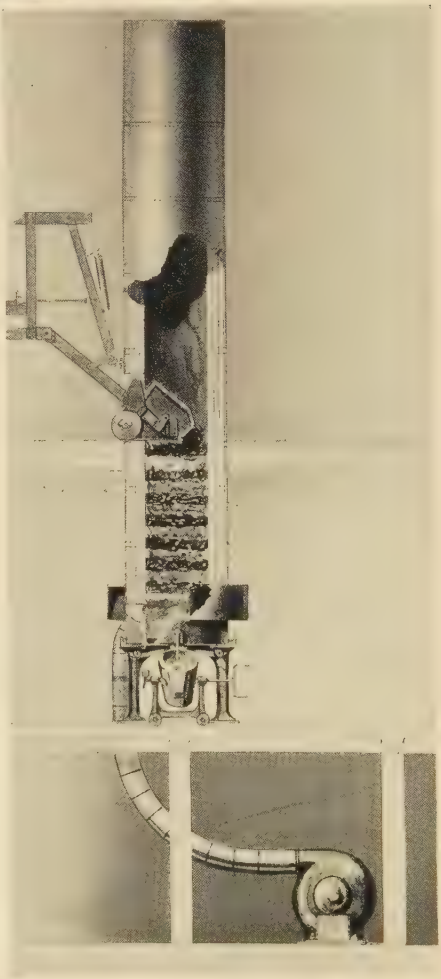
In order to facilitate the handling of supplies during inclement weather two railroad tracks run through the East end of the building.

Raw materials are dumped direct from cars on these tracks into the basement, where such materials as core and foundry sand are conveyed by machinery to conveniently located bins.

Pig iron and scrap iron also are stored in basement, the former being piled in separate groups according to its chemical content.

The basement is sixteen feet high and provides sufficient storage capacity for such quantities of raw material as it is necessary to have on hand to insure constant supply. Particular attention is





given to the storing of raw materials in an orderly manner.

The pig iron, coke and flux are selected and weighed in the basement, and then are taken to the charging floor by special elevators, where the cars containing these materials are emptied directly into the cupola by an automatic charging device.

THE CUPOLA

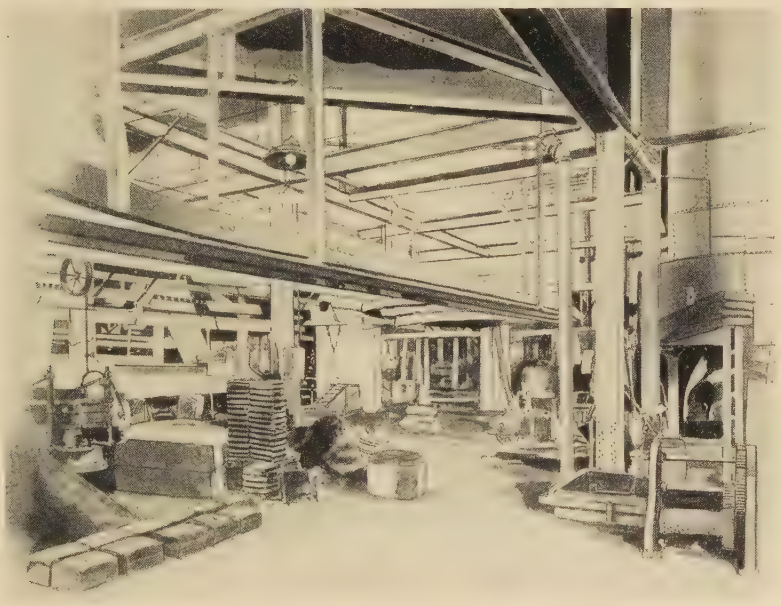
The cupola was especially designed by Crane Co., and recently has been equipped with a cupola charging device on which the company has applied for patents.

The cupola operates continuously from 7 A. M. until 5.30 P. M. and has a melting capacity of one hundred and fifty tons per day.

Test samples of the iron as it comes from the cupola are taken every

fifteen minutes during the day, for the purpose of insuring a correct and uniform quality of iron.

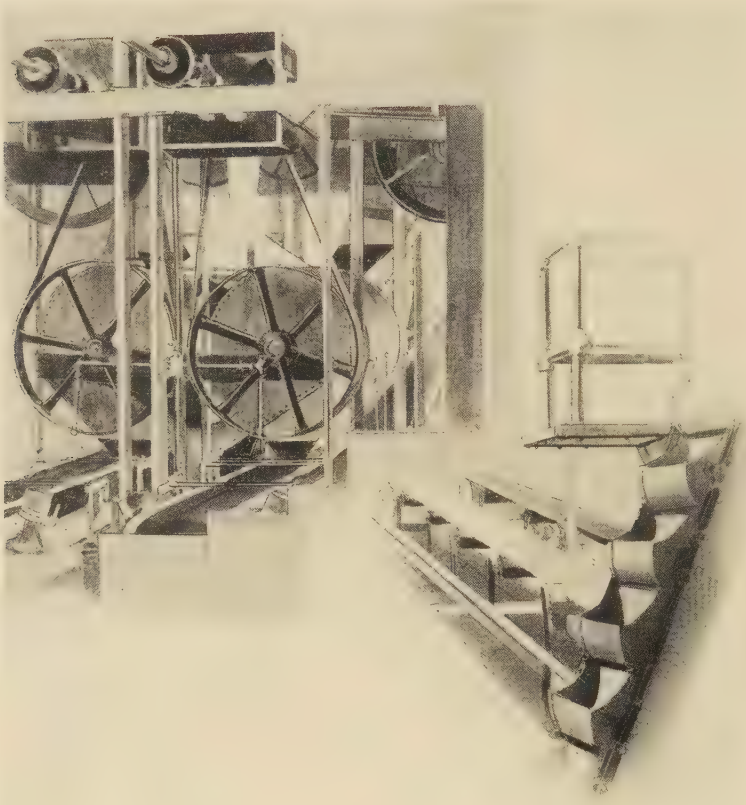
A fan, driven by a 75 horse-power motor, supplies the blast for the cupola. There is also a reserve motor for use in case the regular motor is disabled, thus insuring the continuous operation of the cupola.



THE FOUNDRY

The foundry is placed on the fifth floor. The above illustration shows the southwest section and the connection with the cupola.

To the extreme right will be seen the windlass that operates the trap doors of the cupola, and at the left a molding machine, with molds ready for pouring.

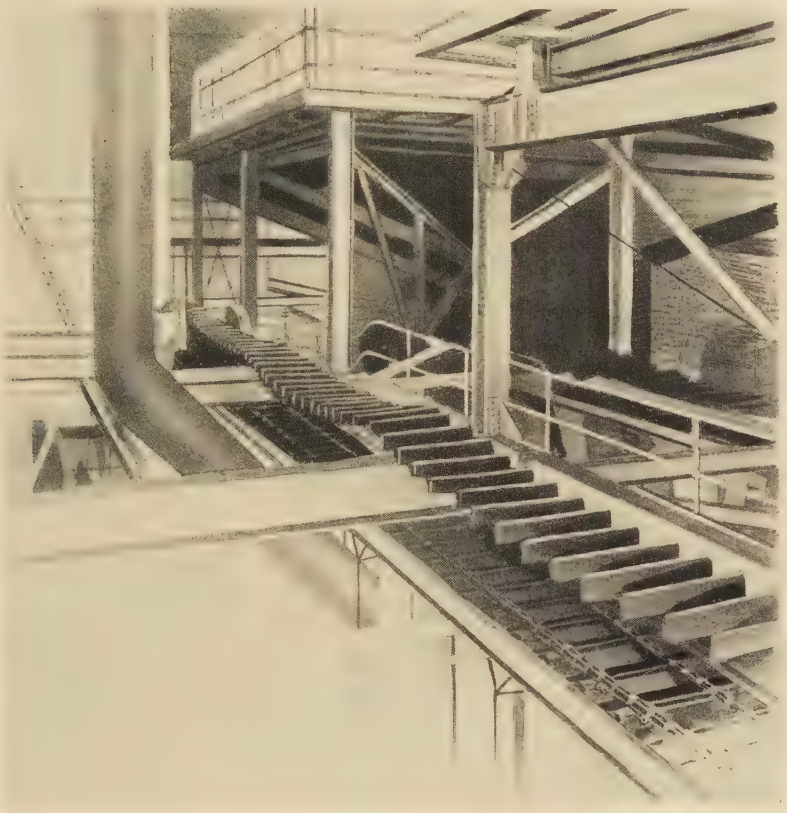


SAND MIXERS AND BUCKET ELEVATOR

The accompanying illustrations show the independent systems of sand riddles, mixers and tempering belts, and a section of the bucket elevator, installed on the gallery above the fifth floor.

New sand is brought from the basement on elevators and added to the used sand in sufficient amount to maintain the proper quality and quantity of sand in the system.

From the mixers the prepared sand drops onto the main carrying belts, and by them is taken to the distributing conveyors, which deliver it to the hoppers over the molders.



SAND CARRIERS

Molding sand in the foundry is handled almost entirely by carriers. The sand is carried overhead, and sand hoppers for the various molding machines are kept filled automatically.

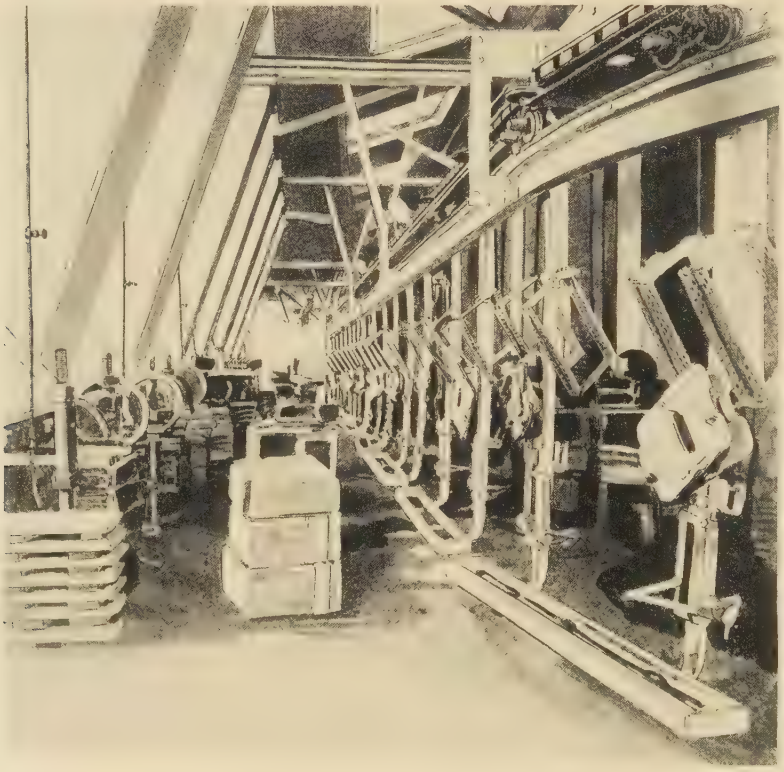
Used and surplus sand falls through gratings in the floor onto another set of conveyors, by which it is carried back to a bucket elevator that delivers it to the overhead tempering system.

MOLD CARRIER SYSTEM

AN INNOVATION in the foundry was the installation of a mold carrier system.

While the mold carrier in the cast iron foundry had been in successful operation for a number of years, there had been much discussion as to whether a similar system would work satisfactorily in a malleable iron foundry.

As this building was erected with the expectation of taking care of the company's needs for many years, it was necessary to make some provision for running the foundry economically at less than full production.



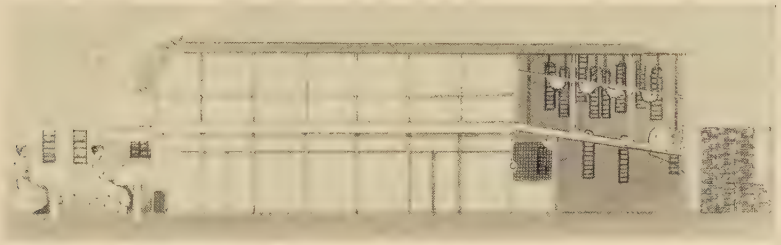
This was accomplished by making the mold conveyor in four sections, which makes it possible to run any one of the four, or any combination of the four, or all four sections, so that a high degree of efficiency and economy may be maintained even though the output fluctuates between wide limits.

These carriers work successfully and the unit system has proved its usefulness.

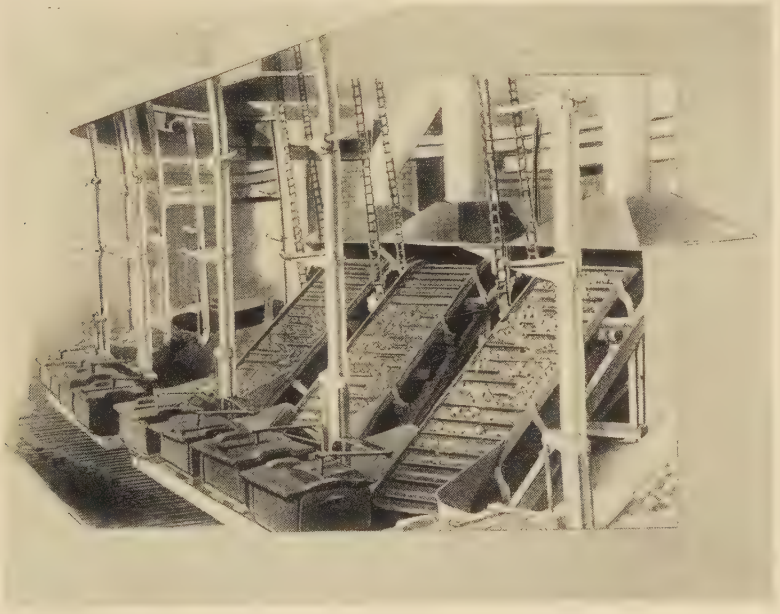
In this new foundry labor costs have been reduced greatly.

CORE MAKING

ANOTHER important innovation, that illustrates the alertness with which this company devises and adopts new methods, is the revolving core dryers, one of which is provided for each of the four carrier units.



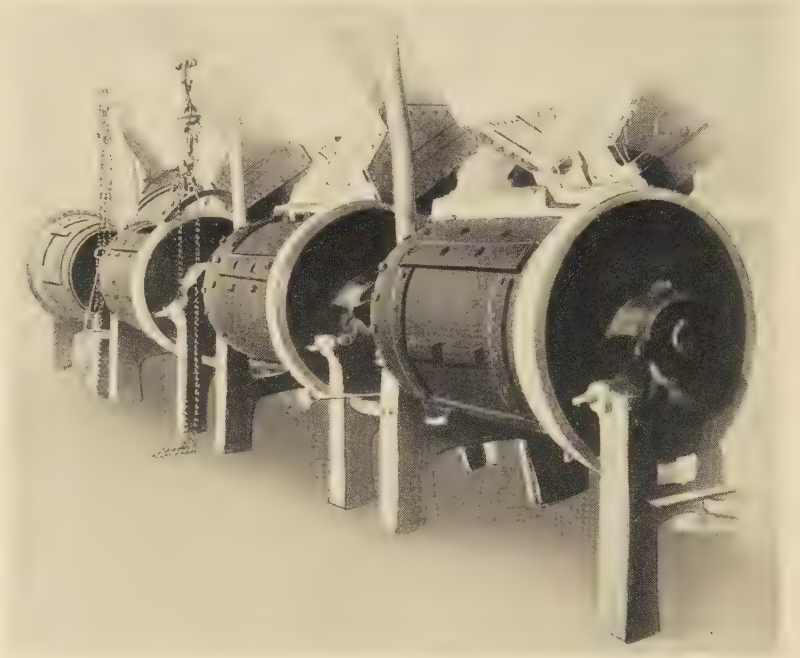
Girls, working at benches, make the cores and place the core shells on conveyors that carry them through large ovens. These ovens are of sufficient size and the speed of the carriers is so arranged that the cores, upon emerging at the opposite end of the dryers, have been thoroughly dried and are ready for use.



The molds, when sufficiently cooled, are knocked from the mold conveyor onto a grating. The sand from the molds falls through this grating and is caught by a conveyor beneath the floor, by which it is returned to the general sand distributing system.

The castings, when shaken out of the molds, are carried by inclined conveyors to chutes through which they pass to the tumbling mills on the floor below.

The accompanying illustration shows the molds on the carrier, the grating through which the sand passes, and the inclined conveyor. The hoods are a part of the ventilating system by which the great quantities of dust are removed.



TUMBLING MILLS

The tumbling mills are specially designed for cleaning castings of the kind made in this factory.

Here, also, particular attention has been given to the removal of dust, the mills being equipped with an exhaust system that delivers the dust to a dust arrester.

ANNEALING ROOM

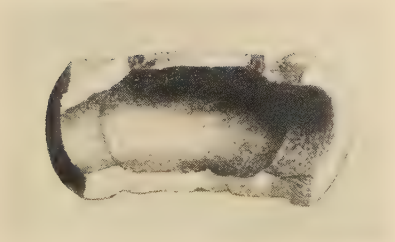
From the tumbling mills the castings are carried, by means of a traveling hopper, to the inspecting bench, where the scrap is picked out, following which they are taken by trucks to the annealing room.

This room contains twelve oil-heated furnaces in which the castings are annealed, these furnaces being provided with various devices for facilitating the handling of the castings.

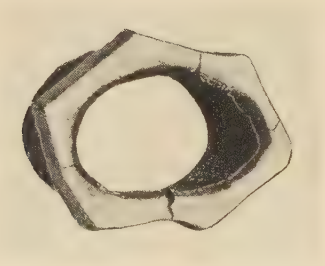
Illustration on the following page shows one corner of the annealing room. The furnace on the left is closed and sealed, while the other one is open, ready to be packed.

The accompanying illustrations are of interest as showing the effects of annealing.

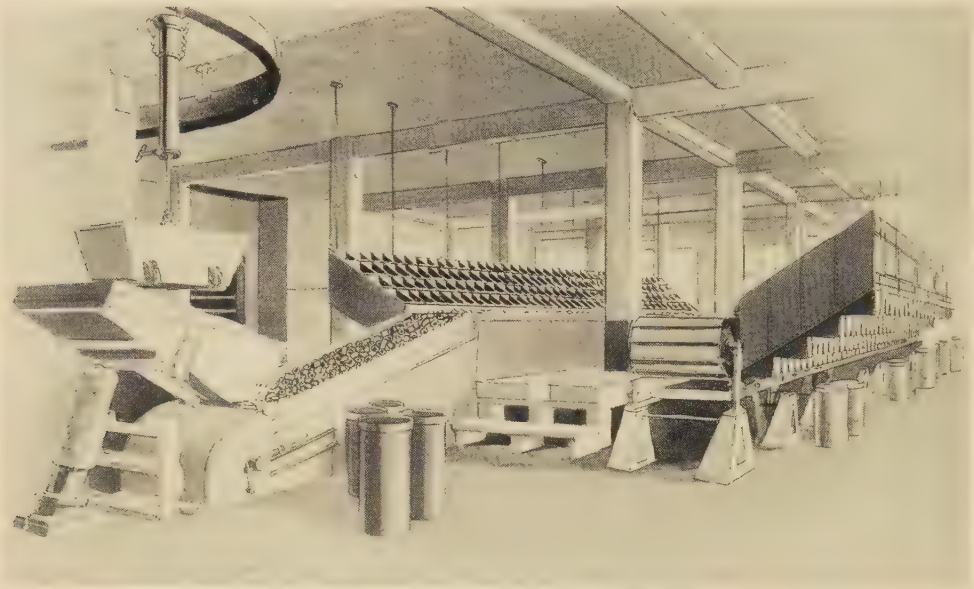
ANNEALING ROOM



CASTING BEFORE BEING ANNEALED. THIS CASTING WAS BROKEN BY ONE BLOW OF THE HAMMER, INDICATING THAT IT WAS EXCEEDINGLY HARD AND BRITTLE



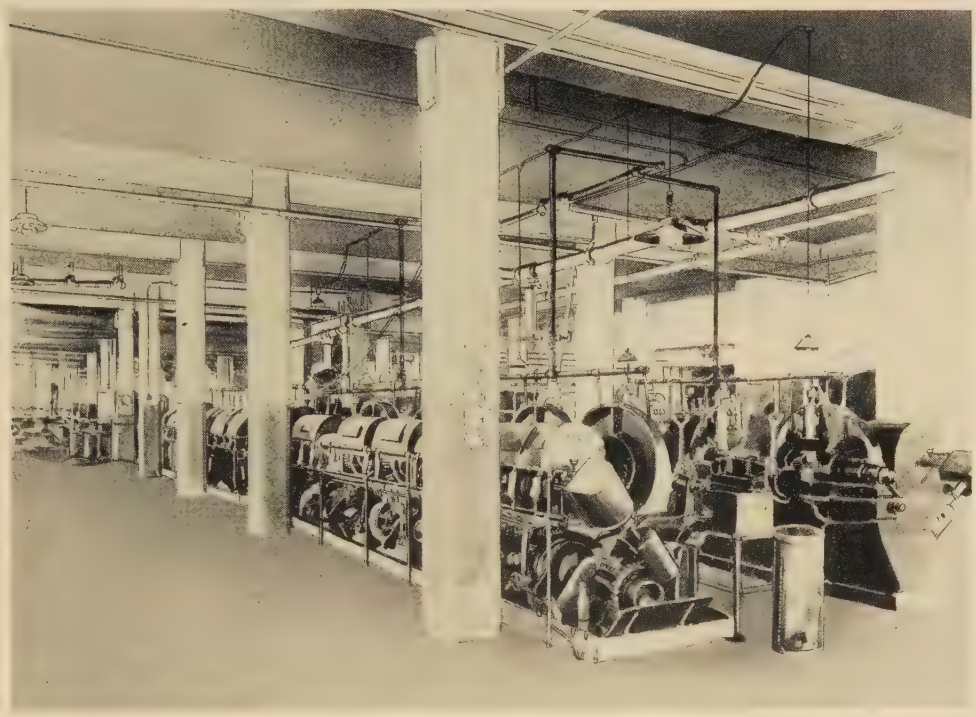
CASTING AFTER ANNEALING. THIS SHOWS MUCH GREATER RESISTANCE, A SEVERE BLOW BEING REQUIRED TO EVEN BEND THE CASTING



ASSORTING CASTINGS

From the annealing room the castings are taken to another set of tumbling mills, where they are tumbled for a short time to remove any iron-oxide that may have formed during the process of annealing and to give them a slight polish.

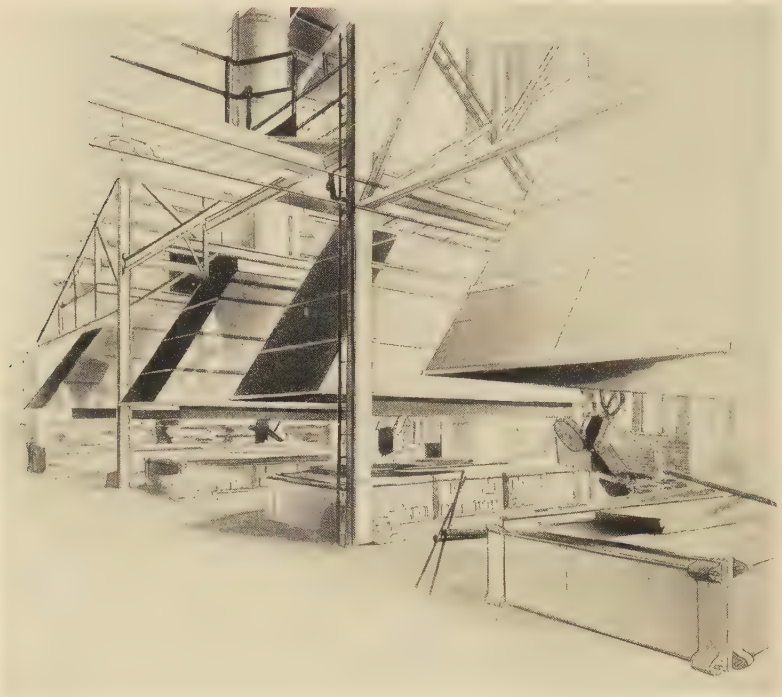
They are then carried by means of overhead buckets, to a traveling belt, from which they are assorted and thrown into hoppers. An ingenious arrangement allows these hoppers to be opened at the bottom, dropping the castings into trucks by which they are transported to chutes leading to the rough storage bins in the machine department on the floor below.



MACHINE SHOP

View of the southeast section of the Machine Room on second floor.

In the foreground is one of the 10-chuck tapping machines illustrated and described on page 152.



GALVANIZING DEPARTMENT

On the same floor with the foundry is the galvanizing department, with four kettles having a capacity of ten tons a day each.

A number of minor improvements were developed in connection with these kettles.

The most noteworthy feature of the department, however, is the care with which the details of the ventilating system were worked out. Heretofore the strong fumes from the kettles made it necessary to have the galvanizing done in a separate building; but in this plant these kettles were placed in the most convenient location, all annoyance from fumes being eliminated by means of an adequate ventilating system, consisting of properly arranged hoods and fans.

This 14-inch galvanized malleable running trap with 8-inch vents and 6-inch clean-out, weighing 900 lbs., made in 1911 for the new Municipal Building, New York City.

An example of the extraordinary articles produced in this factory.

ELECTRIC POWER AND LIGHT

FOR several years prior to the erection of this building the company had been systematically changing over from the old-fashioned shaft and belt drive to individual electrical operation, but this was the first plant to be thoroughly equipped in this respect. Great care was taken in working out the various electrical features and the very latest equipment was provided.

The large machines are operated by individual motors, while the small machines are arranged in groups, with a separate motor for each group.

The electric power is purchased from the Commonwealth Edison Company, and enters transformers in a sub-station in the basement at twelve thousand volts. Here it is transformed to two hundred and twenty volts, and then is delivered to the motors on the different floors through

a switchboard composed of automatic circuit breakers, that afford protection to the motors.

There are one hundred and twenty-five of these motors, with a total of twenty-one hundred horse power.

This system of distribution is of especial interest as it is entirely new and is in use only by Crane Company.

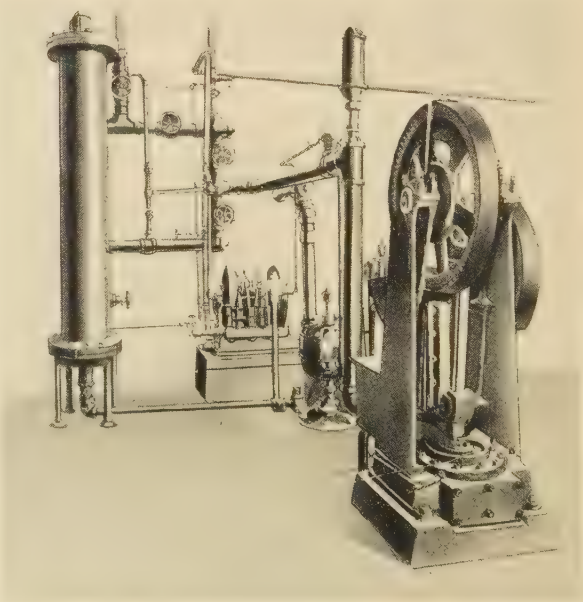
The building contains four electrically-operated elevators and one hydraulic elevator. A separate switchboard controls these electric elevators and also the lighting of the entire building.

SAFETY AND WELFARE OF THE WORKMEN

WHILE these questions always have received a great deal of attention from the company, especial consideration was given them when planning this factory.

The building itself, as already mentioned, is of fire-proof construction and unusually strong and substantial. As a further protection against fire, the oil supply is stored outside the building, ample provision is made for fire hose service throughout the plant, and cleanliness is strictly enforced in every department, all of which reduces the danger from this source to the minimum.

Extraordinary precautions also have been taken to guard against accidents to the employes. Among these may be mentioned the almost total abandonment of the belt drive for operating the machinery, the introduction of a vast number of ingenious safety devices, and the ample amount of space and light provided for carrying on the various operations.



The provisions made for the comfort and health of the employes are most generous.

The high ceilings, the sky-lights in the roof, and the large number of windows afford an abundant supply of light and fresh air, and powerful fans are employed to remove dust and acid fumes and to cool the air whenever the heat becomes excessive.

Lavatories and shower-baths, with hot and cold

water, also individual steel lockers, are provided for both the men and the women workers.

From a well 414 feet in depth pure, cold drinking water is drawn by means of the pump (page 210) and delivered, through a system of piping, to all portions of the plant.

A pleasantly furnished, airy dining-room is arranged for the women and girls, and they are supplied free with hot coffee and sugar. This affords a comfortable place in which they can enjoy the mid-day intermission, and is an exceedingly interesting feature of the plant.

Publisher's Note

At the time of Mr. Crane's death this autobiography was not completed, and as additional text had been prepared by him and he also left some unfinished memoranda, it was decided to continue the work in order that this material might be incorporated in his book.

Then, to complete the history of the company, it was thought well to include the detailed description of the new malleable iron foundry on Canal St. which immediately precedes this chapter.

Mr. Crane had not obtained pictures of the various residences which he had occupied, and as the first two houses were destroyed long ago, the illustrations of these had to be made from descriptions furnished by members of the family and others who remembered the houses.

Miss Sarah Flagg and her brother Henry (who were close friends and neighbors of the family at that period), and Mr. Crane's brother-in-law Leon H. Prentice, also a family that occupied the house at Lake and Ann Streets several years later, were of great assistance in this matter.

The house on Park Avenue also had disappeared, but fortunately a photograph of it was obtained from a gentleman who lived there immediately after the removal of the Crane family.

Photographs of the other residences were easily obtained, as these houses are still standing.

Nothing had been prepared by Mr. Crane regarding Lake Geneva, Wisconsin, and as it was thought that some record ought to be made on this subject, a brief statement, showing how he came to select this place for his country home, and giving a few other facts of interest, has been inserted.

In this chapter also will be found the brief notes that Mr. Crane left concerning his marriage to Mary Josephine Prentice.

Nothing had been written by him with reference to his subsequent marriages, and to complete this portion of his history the following is now added:

In January, 1887, Mr. Crane married Eliza Ann Prentice (sister of his former wife Mary Josephine Prentice), at Pacific Grove, California.

She was born January 16, 1833, in Lockport, N. Y., and her death occurred September 13, 1902, at Lake Geneva, Wisconsin.

On October 14, 1903, Mr. Crane married Emily S. Hutchinson, the ceremony taking place in Trinity Episcopal Church, Chicago.

Record also has been made here of Mr. Crane's last illness and burial.

Following this will be found a short article in regard to his benevolent work, giving, in a general way, his views on this subject and mentioning some important work contemplated by him that has been carried out by his executors.

The book closes with the Crane Family Tree, containing a genealogical record of Mr. Crane's descendants to 1914.

HOW I SUCCEEDED

WHILE a perusal of this history should make clear the reasons why I have been successful in business, I think a few remarks on this subject may be of interest.

When I started in business, I had a fairly good knowledge of brass foundry work as it was then practiced, which was quite primitive, knew something of the brass finishing trade and was a fair machinist. I had received but a very limited education, possessed no business experience whatever, and was quite deficient in the qualities of a good salesman.

Furthermore, as I was a stranger in the city, I, of course, had no friends or acquaintances among the people to whom I naturally had to look for business.

I did, however, possess considerable foresight and ingenuity as well as reasoning power, and was full of enthusiasm, energy and determination.

Also, it was my invariable practice to avoid all deception and trickery such as is often found in salesmen, and I think that everyone with whom I came in contact soon became convinced that I was honorable in all my dealings.

I never have resorted to anything like sharp practice or dishonesty to gain trade, and have laid down a rigid rule throughout my business that everything in the way of sharp practice or making gifts to purchasing agents must be avoided.

For many years I plodded along, gathering ideas about the business as rapidly as I could, but after quite a period it was my good fortune to become acquainted with a number of prominent business men in addition to my uncle Martin Ryerson, among them being Mr. Joseph T. Ryerson, Mr. Hobart H. Taylor, and Mr. F. F. Spencer, and I often consulted them when in doubt concerning business matters.

These gentlemen, who were among the finest business men I ever knew, treated me with the greatest kindness in this respect, and the ideas I received from them, together with my own experience, eventually enabled me to obtain a thorough understanding of business methods.

From the very beginning I put my whole mind on the business, crowding it systematically and persistently, continually adding to our lines, endeavoring to improve our methods of producing goods, pushing the sales, selecting superintendents, foremen and other help, and systematizing and specializing the work.

At the time I started in business in Chicago, the population of this country was comparatively small, and the demand in any of the lines we manufactured was so limited that it would have been impossible to do anything like a large business then in any particular line, even had I possessed the requisite capital.

It was necessary for me to take up any article that I found we could

make profitably, and, as will be seen by this history, we had to manufacture an enormous variety of goods in order to build up our business.

After a while, however, it became evident that the fittings business was growing so rapidly that it would be a good line in which to specialize and we took it up in earnest.

Then, as our capacity for manufacturing became crowded, we gradually dropped one after another of our various outside lines, including steam-warming and elevators, it being my feeling that the rapid growth of the pipe and fittings business would afford an enterprise sufficiently large for myself and family to look after.

It then became my aim to place our plant in advance of all others in the country in the variety and quality of these goods, and with this end in view I have endeavored, not only to carry everything that was called for in this line, but to anticipate the wants of the trade,—that is, instead of lagging behind, to bring out in advance articles that I could see would be needed, which my experience in the steam-fitting line has enabled me to do for many years.

Very early in my business experience I became convinced that, in order to succeed in the large business at which I was aiming, a thorough system must be devised, and as I had received no training that would fit me for this purpose, and was unable to learn of any place where I could obtain the benefit of the experience of others in this direction, it devolved upon me to work out for myself a system of rules and regulations covering every feature of the business.

This, in addition to supervising all the details of the work, not only in the manufacturing departments, but the sales, costs and finances, and general office work as well, was a tremendous undertaking, but I finally succeeded in devising a thorough and complete system.

I believe that our establishment was the first one in this country to go into this matter so extensively, and that few have accomplished anywhere near as much as we have done in this respect.

MY STRUGGLES IN BUILDING UP THE BUSINESS

IT IS difficult to do justice to this subject. No words that I could employ would convey an adequate idea of the enormous amount of anxiety, worry and hard work that I experienced in building up this business. I am sure that very few persons ever went through anywhere near what I have undergone in this respect.

This struggle commenced at the very outset of the business and continued without intermission until about the year 1890. By reason of the high degree of excellence we then had reached in manufacturing, and the establishment of a number of branch houses, (which latter plan had relieved our sales department of much strain), we for the first time were placed in a comfortable position, and since that time we have been making improvements constantly in both of these particulars, the result being that to-day we occupy a position far in advance of all competitors.

For a long time after we had succeeded in establishing our business, the Eastern manufacturers were quite jealous of us and whenever we took up a line of goods on which they had been enjoying a monopoly they exerted every effort to make our venture a failure, often reducing prices in our territory to such low figures that we were compelled to sell below cost.

It will thus be seen that we had a long uphill fight in building up our business, but finally we were successful, and the time came when we were able to retaliate against the Eastern manufacturers, and carry the war into their own territory. Not until then did they show any disposition to change their policy toward us.

While in the elevator and also in the steam-warming business, we were practically at all times in advance of other manufacturers in the quality of our machinery, but we were handicapped by the dishonest methods of scheming competitors who were always conniving with architects and committees and taking unfair advantage of us.

Although competition is exceedingly harassing, there is nothing like it to build up a man's character, and I believe that the struggles which I passed through in this regard were of the greatest value in strengthening my character and developing my business ability.

Institutions that are free from competition are likely to get into a rut and at last die of "dry rot."

Many of our early competitors were men of exceptional character, and the constant fight for business made it necessary for me to be on the alert at all times, not only in selecting goods to manufacture and improving the quality of our product, but also in seeking business.

As illustrating the strife for business in the early days, I recall that one of our competitors in the brass finishing line remarked to me one day that he wore out two horses a year chasing around Chicago after business.

Although I was chasing after him, I did not wear out as many horses as he did, and yet I kept up a lively fight.

INCORPORATING OUR COMPANY

ONE of my objects in incorporating our company was to get some outside capital invested in the business. I never made much effort, however, to do this and sold only two blocks of our stock outside, all of which I afterwards bought up, as I became convinced that it was much better to keep the stock in the hands of my family and a few of our important men who were working for the success of the business.

This has proved to be a sound business policy. I maintain that it is exceedingly unwise for anyone to work hard building up a successful business, and then divide the profits with others who contributed nothing to its success.

So far as I know, ours was the first corporation to adopt the plan we have followed in regard to the capital stock; that is, requiring employes who are allowed to purchase stock to surrender it to the company on leaving its employ. Had we not adopted this precaution, it is quite probable that our stock now would be considerably scattered.

MY SUCCESS OUTSIDE OF BUSINESS

NO DOUBT opinions differ greatly as to what constitutes success in life, and possibly there are many who will look upon as successful one who merely accumulates a large fortune. I think no one will deny that such a person is entitled to much credit for attaining a high position in this respect, provided, of course, it has been done in a proper manner and through his own efforts.

But if that is the extent of his accomplishment, that is, if he is one of those "money-making machines" whose sole aim and purpose in life is the accumulation of great wealth; in other words, if he has neglected to give due attention to the care and improvement of his family, has failed to devote a portion of his time to a serious consideration of at least a few of the many important questions on which society is greatly in need of assistance, and if he has made no effort to take a reasonable amount of rational enjoyment or to do anything in the way of building up his own character, then I take the ground that he cannot be looked upon as being successful in the fullest sense of the term.

Thus far in this history I have referred only to the success I have met with in connection with my business career. I now deem it proper to go a little further in order to show that, notwithstanding the very heavy demands which my business has made upon my energies, I always have taken great interest in and given considerable attention to various questions pertaining to social economics.

For a number of years I was an active member of the Citizens' Association and the Citizens' League, which organizations had for their object the correcting of the many abuses that constantly are occurring in a city like Chicago.

I was the prime mover in organizing the undertaking that resulted in the construction, in the year 1873, of a beautiful exposition building on the lake front at the foot of Adams Street.

This building played a very prominent part in the history of Chicago for about twenty years, but at the time of the World's Fair it was torn down to provide a site for the present Art Institute.

In my younger days I devoted a reasonable amount of attention to politics and was quite active in my own ward. While I never aspired to a political office, I was honored once by being proposed for the office of Mayor of Chicago.

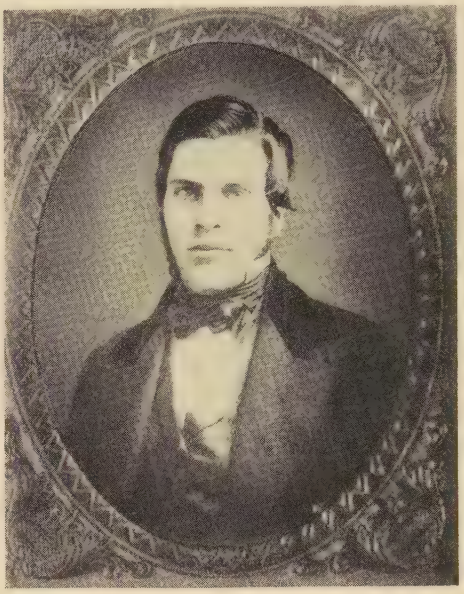
This occurred about the year 1885, at which time the public had grown very much dissatisfied with the regular political parties.

This feeling finally became so strong that an independent movement was started, with the result that a special meeting was held in the old Exposition Building. At this meeting I received the nomination above mentioned, and placards containing this announcement were posted throughout the city.

Back of this independent movement was the hope that one of the regular parties would adopt me as its candidate, but as both of them declined to do so, the movement failed.

Naturally, I felt that the confidence shown in me at that time was a great compliment, as the meeting referred to was a very large and enthusiastic one.

MARY JOSEPHINE PRENTICE



RICHARD TELLER CRANE

ABOUT THE TIME OF THEIR MARRIAGE, OCTOBER 8, 1857.

MY EARLY MARRIED LIFE

ON THE 8th of October, 1857, I was married to Miss Mary Josephine Prentice, in Lockport, N. Y.

She was a thoroughly Christian woman, of beautiful character, decidedly domestic in her tastes and was greatly devoted to her children, doing everything she could to bring them up under religious influences.

She also took a deep interest in my business and shared in all my struggles, and unfortunately these struggles interfered in many ways with our full enjoyment of domestic happiness, for when a man is constantly working and putting forth every effort to build up a business he is not likely to be very companionable.

I have deeply regretted that she could not be spared to share more in my prosperity.

Her death occurred January 28th, 1885.

After our marriage we first lived in a boarding house on Halsted Street, at the northwest corner of the alley north of Lake Street.

Although we paid only $7.00 a week for our room and board, the times were so hard, on account of the panic, that we thought this amount was more than we could afford, and therefore we moved to No. 13 North Curtis Street, where we went to housekeeping, thereby reducing our household expenses to about $4.00 a week.

We occupied this house for about five years. Here Charles, Herbert and George were born.

At this time (1863) my business had become so prosperous that we decided to seek more commodious quarters, and then rented the east half

of a house located at the southwest corner of Lake and Ann Streets, where we resided for three years. At first this step appeared to be quite a piece of extravagance, and we very much doubted whether we could afford it.

Kate (Mrs. A. F. Gartz) was born here.

The next change that we made in our place of residence occurred in 1866, when we moved to No. 18 Park Avenue, where Mary (Mrs. E. A. Russell) was born. We remained here for one year.

The following year (1867) we moved to the north side of Randolph St. between Elizabeth St. and Willard Place—No. 399, (now number 1244).

RICHARD TELLER CRANE AND FAMILY, PAINTED BY PIKE, 1875

MRS. RICHARD TELLER CRANE

ABOUT 1875

RICHARD TELLER CRANE

One year later we moved to No. 312 Washington Boulevard (now number 1105), where we remained about three years. This house is located on the south side of the boulevard, between Curtis and May Streets.

Here Frances (Mrs. F. R. Lillie) and Emily (Mrs. Chadbourne) were born.

In 1871 we rented from my Uncle Martin Ryerson his house at the northwest corner of Washington Boulevard and Willard Place, where he lived just prior to going abroad for an extended visit.

We occupied this house for twenty years, and Richard and Leon were born here.

In the year 1890 we built our present home at 2541 Michigan Avenue.

WEST VIEW

EAST VIEW

JERSEYHURST, THE COUNTRY HOME OF
RICHARD TELLER CRANE

CLOVER BANK
HOME OF CHARLES R. CRANE, JERSEYHURST

GLEN MARY
HOME OF MRS. A. F. GARTZ, JERSEYHURST

EL NIDO

HOME OF HERBERT P. CRANE, JERSEYHURST

JERSEYHURST, LAKE GENEVA

ITS SELECTION BY MR. CRANE FOR HIS COUNTRY HOME

IN THE summer of 1879 Mr. Crane, accompanied by Mrs. Crane, their son Richard, and Mrs. Crane's sister Eliza, took a pleasure trip into Wisconsin with the intention of visiting some of the lakes and also calling on their son Herbert, who was camping at Lake Geneva, west of Marengo camp (where he also had been during the preceding summer), in order to take to him his saddle-horse "Bill."

This trip was made in a surrey drawn by their black team "Jennie" and "Pete," which horses were great pets of the family.

When starting out the saddle-horse was tied to the rear of the surrey, but as he was exceedingly lively and broke loose several times, it finally was necessary to untie him and let him go. As soon as this was done he became quiet and playfully followed along behind just as a dog might do, occasionally jumping fences for his own amusement, but giving them no further trouble.

At that time this lake was known chiefly as a place for fishing and camping. Only a few large summer homes had been built there, and these were situated near the village of Lake Geneva.

Mr. Crane was so greatly impressed with the beauty of the lake and its surroundings that he felt he would like to have a home there, and after looking into the matter carefully he decided to purchase the Edward Quigley farm of twenty-three acres on the north shore of the lake.

This location was selected by Mr. Crane largely through the recommendation of his son Herbert, who explained to him its many advantages.

Mr. Crane at once proceeded to erect the house illustrated on page 224 and it was ready for occupancy the following year (1880).

From that time on he spent every summer there, and often was heard to remark that it never was necessary for him to leave this place for pleasure.

It was given the name of "Jerseyhurst" after Mr. Crane's native state, New Jersey.

From time to time various buildings were added, such as barns, superintendent's cottage, boarding-house for the workmen, green-houses, and a grapery,—the last named being Mr. Crane's especial pride and joy.

Additional land also was acquired, two 10-acre tracts being purchased in 1880 and a 37-acre tract in 1901.

One of the first things to be provided by Mr. Crane for the enjoyment of his family was a steam yacht, which he named "Passaic" in memory of the Passaic Falls, New Jersey, near which he was born.

This steamer was designed by Henry Warrington, of Chicago, and the hull was built by a boat-builder at Lake Geneva named William Napper. The engine was cast in Mr. Crane's foundry and finished in his machine-shop, all of this work as well as the installing of the engine in the boat, being done by his son, Herbert.

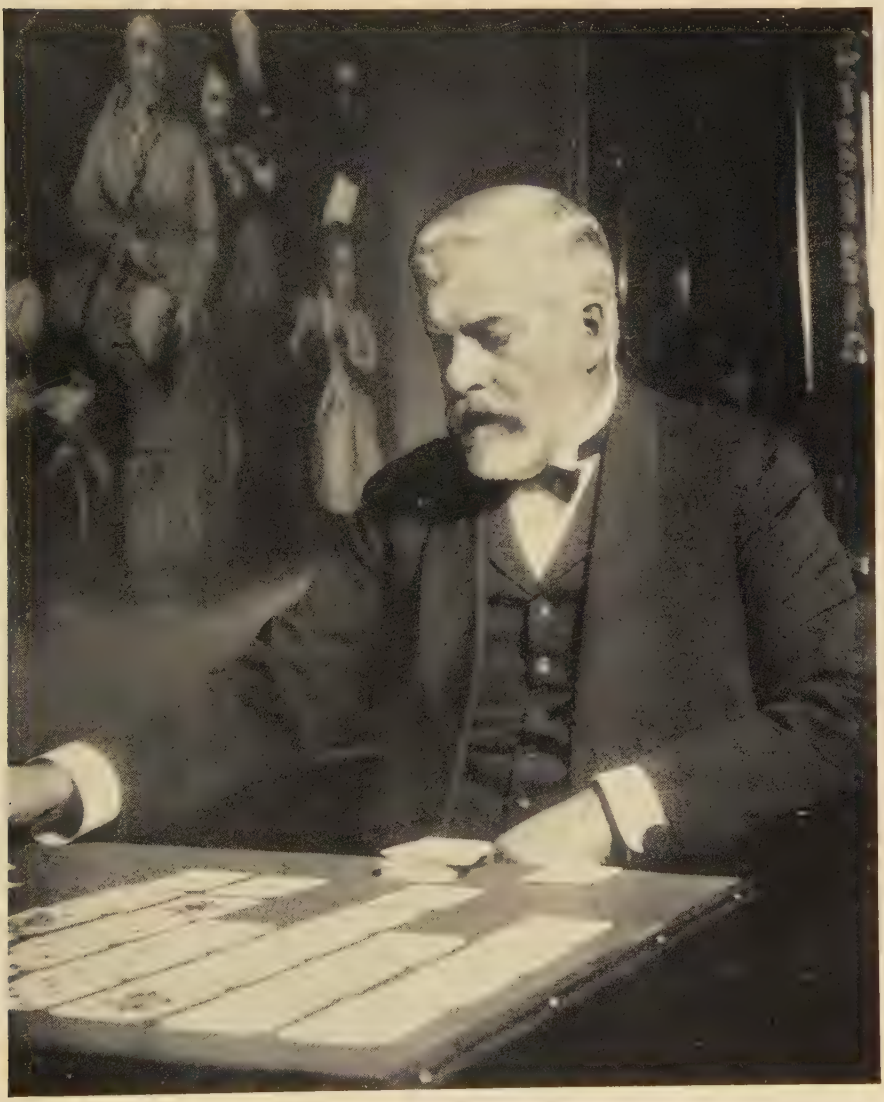
This boat was completed early in June, 1880, and served the family satisfactorily for twenty years.

Mr. Crane then decided that a larger and faster boat was needed, whereupon he had the present "Passaic,"—a fine steel steam yacht,—built in Racine, Wis.

His first steamer then passed into other hands at the lake, where it has continued to give good service up to the present time (1915).

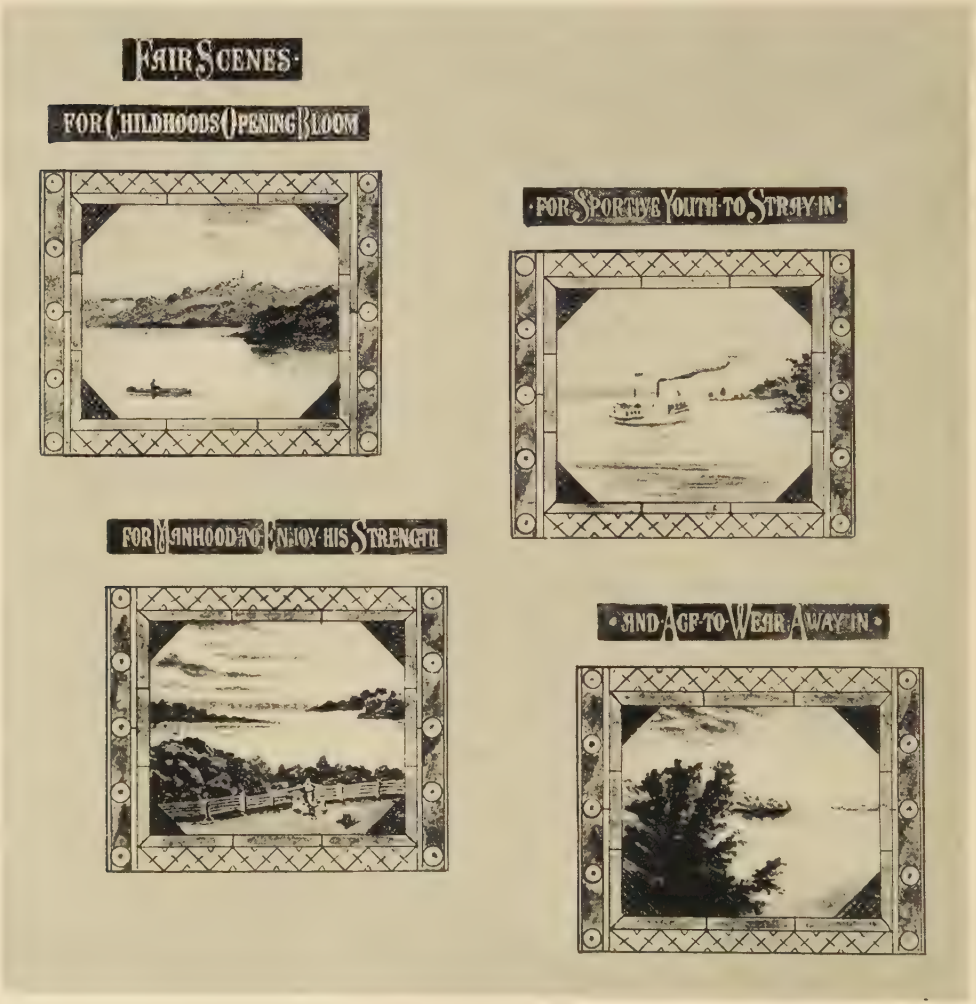
One of Mr. Crane's chief delights in Jerseyhurst was the family life there. At first the "big house" sheltered all of the family as well as their many friends. Later on, as his children married, he built on these grounds first "Cloverbank" for his son Charles, next "El Nido" for his son Herbert, and then "Glen Mary" for his daughter Kate (Mrs. Gartz), the latter house being designed originally by Herbert.

Jerseyhurst holds a big place in the memories of all the Crane family. His daughter Frances and Frank R. Lillie were married there, as well as his grand-daughter Josephine and Harold C. Bradley.



AN EVENING PASTIME

Although only two of the grand-children (Charles R. Crane II, and A. F. Gartz, Jr.), were born there, it was home to them all and gave the older ones a childhood to look back upon with never-ending joy.

Perhaps the spirit of Jerseyhurst is best described in the following lines that appear in stained glass in the stair-window in Mr. Crane's house above four views of the lake:

FAIR SCENES
FOR CHILDHOODS OPENING BLOOM
FOR SPORTIVE YOUTH TO STRAY IN
FOR MANHOOD TO ENJOY HIS STRENGTH
AND AGE TO WEAR AWAY IN

MR. CRANE'S LAST ILLNESS

UP TO the time of his last illness Mr. Crane, although nearing his eightieth birthday, was exceedingly vigorous and active and gave close attention to his business.

His death occurred on Monday, January 8th, 1912, at his residence, 2541 Michigan Avenue, Chicago, after an illness (brought on by a severe cold) lasting only four days.

Funeral services were held Thursday, January 11th, at 10 o'clock A. M., in Trinity Episcopal Church, corner of Michigan Avenue and Twenty-sixth Street, the rector Rev. John M. McGann officiating, assisted by Rev. Zebarney B. Phillips, a former rector of this church.

The active pall-bearers (chosen from the officials and department heads of the Crane Company) were:

John B. Berryman
R. B. Stiles
J. C. Kilgore
C. A. G. Wayman
J. H. Wrath
C. R. Smith
Peter Botham
E. W. Smith

The honorary pall-bearers were:

A. C. Bartlett
E. B. Butler
E. W. Blatchford
J. Harley Bradley
Wm. A. Fuller
James B. Forgan
Harlow N. Higinbotham
Charles L. Hutchinson
Ernest A. Hamill
T. J. Lefens
Wm. R. Linn
A. D. MacGill
Augustus C. Magnus
Wm. A. Pope
Albert A. Sprague
Orson Smith
Charles A. Wacker

On conclusion of the services at the church, which were attended by many of Chicago's leading business men, as well as a large number of Mr. Crane's employes, the relatives and a few of the closest friends went by special train on the Chicago & North-Western Railroad to Lake Geneva, Wisconsin.

There, after brief services, interment took place in the family lot in Oak Hill Cemetery, which Mr. Crane selected many years ago for his final resting place.

"A GREAT LIFE HAS PASSED INTO THE TOMB AND THERE AWAITS THE REQUIEM OF WINTER'S SNOWS"

MR. CRANE'S VIEWS REGARDING BENEVOLENT WORK

NOTHING had been prepared by him on this subject for his autobiography, and no attempt will be made here to record all that he did in this direction. The intention is simply to set forth his views in a general way, as he had expressed the hope that his family would continue the work which he started and that it would confine its charities to the lines he always supported.

On this subject, as in everything else, Mr. Crane was intensely practical, and therefore it is easily understood that he firmly opposed anything that might be considered ornamental or artificial. He took the ground that charity should be confined "almost exclusively to helping the lower strata," and, further, that "it should begin at home."

An illustration of Mr. Crane's efforts to assist people to become self-supporting is found in his introduction of manual-training in the Chicago public schools.

He took a deep interest in the question of practical education for boys who have to make their own way in the world, and believing that a course in manual-training would afford them an excellent foundation, he obtained permission from the Board of Education in the year 1891 to establish a department for this work in the Tilden school, corner of Lake and Elizabeth streets.

Later on courses in household arts and construction work for girls were added, and the work was further enlarged by the establishing of similar departments in five more elementary schools.

This work was supported by Mr. Crane until the year 1911, when it was taken over by the Board of Education. More than Eighty Thousand Dollars was expended by him in carrying on this enterprise, and it was of incalculable value not only to this community but to the entire country.

The welfare of his employes was a matter in which Mr. Crane took especial interest, and early in the history of the company he established a sick benefit and pension plan for the relief of deserving workmen and their families.

Later he organized a medical department, the services of which are available to employes of the company without cost to them.

It was his desire that work along these lines should be increased whenever it appeared that this was needed and could be afforded.

Knowing that Mr. Crane had contemplated establishing the following funds:

One Million Dollars as a pension fund for Crane Company employes;

One Million Dollars for the support of deserving widows and their children;

One Hundred Thousand Dollars for the support of the Mary Crane Nursery;

these wishes were duly carried out by his executors.

They also contributed Twenty-five Thousand Dollars to the Visiting Nurses' Association of Chicago and Ten Thousand Dollars to the Lake Geneva Fresh Air Association, in conformity to Mr. Crane's desires.

Provisions for the pension and the widows' and children's funds were made by setting aside capital stock of the Crane Company, the earnings of which are to be used for these purposes, such funds being controlled by trustees selected for this purpose.

It was decided to use the widows' and children's fund in supporting, for the time being, the settlement already extensively established for the same purpose by his daughter, Mrs. F. R. Lillie, at her farm near Wheeling, Illinois, a work in which Mr. Crane had taken great interest.

THE FAMILY TREE

RICHARD TELLER CRANE

SON OF ..... *Timothy Botchford Crane and Maria Ryerson, who were married in February, 1827.*

BORN ..... *May 15, 1832, at Paterson, N. J.*

MARRIED ..... *October 8, 1857, at Lockport, N. Y.*

DIED ..... *January 8, 1912, at Chicago.*

MARY JOSEPHINE PRENTICE

DAUGHTER OF ..... *Alonzo Tyng Prentice and Emeline Rockwell, who were married December 6, 1823, at Buffalo, N. Y.*

BORN ..... *February 22, 1835, at Lockport, N. Y.*

DIED ..... *January 28, 1885, at Chicago.*

CHILDREN
OF RICHARD TELLER AND MARY JOSEPHINE CRANE

CHARLES RICHARD, *born August 7, 1858, at 13 N. Curtis St., Chicago.*

HERBERT PRENTICE, *born June 6, 1861, at 13 N. Curtis St., Chicago.*

GEORGE HAMILTON, *born December 11, 1862, at 13 N. Curtis St., Chicago. Died February 21, 1864.*

KATE ELIZABETH, *born February 2, 1865, at Lake and Ann Sts., Chicago.*

MARY RYERSON, *born August 30, 1866, at 18 Park Avenue, Chicago.*

FRANCES WILLIAMS, *born August 30, 1869, at 312 Washington Boulevard, Chicago.*

EMILY ROCKWELL, *born March 4, 1871, at 312 Washington Boulevard, Chicago.*

RICHARD TELLER, JUNIOR, *born November 7, 1873, at 369 Washington Boulevard, (corner of Willard Place), Chicago.*

LEON HAROLD, *born October 27, 1875, at 369 Washington Boulevard, Chicago. Died July 22, 1876, at Overbrook, Pa. (a suburb of Philadelphia).*

CHARLES RICHARD CRANE

SON OF..... *Richard T. Crane*
BORN..... *August 7, 1858, at 13 N. Curtis St., Chicago.*
MARRIED..... *November 2, 1881, at Paterson, N. J.*

CORNELIA WORKMAN SMITH

DAUGHTER OF..... *John Oliver Smith and Sarah Ellen Workman, who were married Nov. 16, 1859, at 25 Elm St., Worcester Mass.*
BORN..... *March 13, 1862, at Paterson, N. J.*

CHILDREN

RICHARD TELLER, THIRD, *born August 12, 1882, at Denver, Colo.*
CORNELIA, *born December 22, 1883, at 475 W. Adams St., Chicago. Died April 17, 1886.*
MARY JOSEPHINE, *born April 23, 1886, at Southern Hotel, Wabash Ave. and 22nd St., Chicago.*
FRANCES ANITA, *born November 8, 1887, at 516 So. Ashland Boul., Chicago.*
JOHN OLIVER, *born December 28, 1899, at 2559 Michigan Avenue, Chicago.*

HERBERT PRENTICE CRANE

SON OF..... *Richard T. Crane.*
BORN..... *June 6, 1861, at 13 N. Curtis St., Chicago.*
MARRIED..... *February 22, 1883, at 117 So. Sangamon St., Chicago.*

JESSIE ELIZABETH DOOLITTLE

DAUGHTER OF..... *Edgar Mantell Doolittle and Elizabeth Ellen Edwards, who were married at 79 W. Adams St., Chicago, in June, 1846.*
BORN..... *May 18, 1861, at 117 So. Sangamon St., Chicago.*

CHILDREN

HERBERT PRENTICE, JUNIOR, *born January 5, 1884, at 117 So. Sangamon St., Chicago.*
HAROLD DOOLITTLE, *born June 25, 1885, at 117 So. Sangamon St., Chicago. Died February 16, 1886.*
DOROTHY SAXON, *born June 22, 1887, at 117 So. Sangamon St., Chicago.*
VALENTINE ROCKWELL, *born February 14, 1889, at 117 So. Sangamon St., Chicago.*
CHARLES RICHARD, SECOND, *born August 7, 1892, at Lake Geneva, Wis.*

KATE ELIZABETH CRANE

DAUGHTER OF ..... *Richard T. Crane.*

BORN ..... *February 2, 1865, at Lake and Ann Sts., Chicago.*

MARRIED ..... *January 9, 1888, at 3rd Presbyterian Church, Chicago.*

ADOLPH FREDERIC GARTZ

SON OF ..... *Herman Adolph Gartz and Dorothea Madeline Strohmeyer, who were married May 1, 1855, at Brooklyn, New York.*

BORN ..... *November 12, 1861, at 321 Broome St., New York City.*

CHILDREN

MARY DOROTHEA, *born October 5, 1891, at 136 Pine St., Chicago. Died December 30, 1903.*

ADOLPH FREDERIC, JUNIOR, *born August 28, 1893, at Lake Geneva, Wis.*

RICHARD CRANE, *born October 25, 1894, at 2635 Prairie Ave., Chicago.*

BARBARA JANE, *born September 24, 1899, at 5225 Lexington Ave., Chicago. Died December 30, 1903.*

GLORIA, *born October 12, 1907, at 912 Diversey Parkway, Chicago.*

MARY RYERSON CRANE

DAUGHTER OF ..... *Richard T. Crane.*

BORN ..... *August 30, 1866, at 18 Park Avenue, Chicago.*

MARRIED ..... *November 1, 1888, at 369 Washington Boul., Chicago.*

EDMUND ALLEN RUSSELL

SON OF ..... *Edmund Russell and Jane Cook, who were married December 24, 1848, at Brooklyn, N. Y.*

BORN ..... *July 1, 1856, at Catskill, N. Y.*

CHILDREN

EDMUND ALLEN, JUNIOR, *born February 1, 1891, at 2541 Michigan Avenue, Chicago.*

EMILY CRANE, *born February 26, 1896, at 2541 Michigan Avenue, Chicago.*

MAROUSSA, *born February 24, 1901, at 2541 Michigan Avenue, Chicago.*

FRANCES WILLIAMS CRANE

DAUGHTER OF..... *Richard T. Crane.*

BORN..... *August 30, 1869, at 312 Washington Boul., Chicago.*

MARRIED..... *June 29, 1895, at Lake Geneva, Wis.*

FRANK RATTRAY LILLIE

SON OF..... *George Waddell Lillie and Emily Rattray, who were married August 29, 1867, at Concord, Mass.*

BORN..... *June 27, 1870, at Toronto, Canada.*

CHILDREN

CATHERINE CRANE, *born June 14, 1899, at 2559 Michigan Avenue, Chicago.*

MARGARET EMILY, *born February 4, 1903, at 5801 Kenwood Avenue, Chicago.*

MARY PRENTICE, *born September 27, 1906, at St. Margaret's Hospital, Mount Vernon St., Boston, Mass.*

ALICE RATTRAY, *born March 29, 1909, at 5801 Kenwood Avenue, Chicago. Died July 1, 1909.*

EMILY ANN, *born March 24, 1913, at Michael Reese Hospital, Chicago.*

ALBERT REED TRENHOLM, *(adopted child), born August 17, 1892, at Los Angeles, Calif.*

ETHAN AIKEN, *(foster child), born May 7, 1889, in Illinois.*

KARL CHRISTOPHER, *(foster child), born May 22, 1904, at Boston, Mass.*

EMILY ROCKWELL CRANE

DAUGHTER OF..... *Richard T. Crane.*

BORN..... *March 4, 1871, at 312 Washington Boul., Chicago.*

MARRIED..... *November 7, 1896, at 2541 Michigan Ave., Chicago.*

THOMAS LINCOLN CHADBOURNE, JUNIOR

RICHARD TELLER CRANE, JUNIOR

SON OF ..... *Richard T. Crane.*

BORN ..... *November 7, 1873, at 369 Washington Boul., Chicago.*

MARRIED ..... *June 4, 1904, at 2838 Michigan Ave., Chicago.*

FLORENCE HIGINBOTHAM

DAUGHTER OF ..... *Harlow Niles Higinbotham and Rachel Debora Davison, who were married Dec. 7, 1865, at Joliet, Ill.*

BORN ..... *February 5, 1873, at No. 1244 (now No. 2710) Prairie Avenue, Chicago.*

CHILDREN

CORNELIUS, *born June 29, 1905, at 234 Lincoln Park Boulevard, (now 932 Lincoln Parkway), Chicago.*

FLORENCE, *born February 25, 1909, at 1430 Lake Shore Drive, Chicago.*

RICHARD TELLER CRANE, THIRD

SON OF ..... *Charles R. and Cornelia S. Crane.*

BORN ..... *August 12, 1882, at Denver, Colorado.*

MARRIED ..... *September 22, 1909, at Berry Hill, Halifax Co., Virginia.*

ELLEN DOUGLAS BRUCE

DAUGHTER OF ..... *Alexander Bruce and Mary Evelyn Anderson, who were married April 18, 1855, at "Montrose," Fincastle, Botecourt Co., Virginia.*

BORN ..... *July 25, 1872, at Berry Hill, Halifax Co., Virginia.*

DAUGHTER

ELLEN DOUGLAS BRUCE, *born May 9, 1913, at Michael Reese Hospital, Chicago.*

MARY JOSEPHINE CRANE

DAUGHTER OF ..... *Charles R. and Cornelia S. Crane.*

BORN ..... *April 23, 1886, at Southern Hotel, Chicago.*

MARRIED ..... *July 8, 1908, at Lake Geneva, Wis.*

HAROLD CORNELIUS BRADLEY

SON OF ..... *Cornelius Beach Bradley and Mary Comings, who were married July 30, 1871, at Oberlin, Ohio.*

BORN ..... *November 25, 1878, at Oakland, California.*

CHILDREN

MARY CORNELIA, *born May 2, 1909, at St. Luke's Hospital, Chicago. Died January 15, 1916, at Madison, Wis.*

CHARLES CRANE, *born January 11, 1911, at Michael Reese Hospital, Chicago.*

HAROLD CORNELIUS, JUNIOR, *born April 8, 1913, at Michael Reese Hospital, Chicago.*

DAVID JOHN, *born February 22, 1915, at Michael Reese Hospital, Chicago.*

FRANCES ANITA CRANE

DAUGHTER OF ..... *Charles R. and Cornelia S. Crane.*

BORN ..... *November 8, 1887, at 516 So. Ashland Boul., Chicago.*

MARRIED ..... *January 4, 1907, at 2559 Michigan Ave., Chicago.*

ROBERT WILLIAM LEATHERBEE

SON OF ..... *Charles William Leatherbee and Harriet Grey Felton, who were married May 4, 1876, at West Newton, Mass.*

BORN ..... *March 1, 1882, at West Newton, Mass.*

CHILDREN

CHARLES WILLIAM, SECOND, *born August 14, 1907, at West Newton, Mass.*

ROBERT WILLIAM, JUNIOR, *born March 20, 1910, at 2559 Michigan Avenue, Chicago.*

RICHARD CRANE, *born May 8, 1914, at 2559 Michigan Avenue, Chicago.*

DOROTHY SAXON CRANE

DAUGHTER OF ..... *Herbert P. and Jessie D. Crane.*

BORN ..... *June 22, 1887, at 117 So. Sangamon St., Chicago.*

MARRIED ..... *November 11, 1914, at the Home of Mr. and Mrs. E. A. Russell, Lake Forest, Illinois.*

AUGUSTUS KINLOCH MAXWELL

SON OF ..... *Henry Black Maxwell and Sarah Homer West, who were married June 16, 1879, at Clinton, Conn.*

BORN ..... *March 24, 1882, at 510 Webster Avenue, Chicago.*

EDMUND ALLEN RUSSELL, JUNIOR

SON OF ..... *Edmund A. and Mary C. Russell.*

BORN ..... *February 1, 1891, at 2541 Michigan Avenue, Chicago.*

MARRIED ..... *May 18, 1912, at 4833 Woodlawn Avenue, Chicago.*

HELEN RIDENOUR GREELEY

DAUGHTER OF ..... *George Thornton Greeley and Eva French Ridenour, who were married March 31, 1886, at Clarinda, Iowa.*

BORN ..... *March 20, 1887 at Nashua, Iowa.*

CHILDREN

RUTH, *born March 12, 1913, at Washington, D. C.*

EDMUND ALLEN, THIRD, *born May 12, 1916, at Baltimore, Md.*

CHARLES RICHARD CRANE, SECOND

SON OF ..... *Herbert P. and Jessie D. Crane.*

BORN ..... *August 7, 1892, at Lake Geneva, Wis.*

MARRIED ..... *June 22, 1916, at 700 Irving Park Blvd., Chicago.*

MARGERY BAKER

DAUGHTER OF ..... *William Henry Baker and Belle Clement, who were married June 22, 1891, at Chicago.*

BORN ..... *April 26, 1892, at 1473 W. Monroe St., Chicago.*

NOTE: This family tree is complete to 1914 only.

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